ADVERTISING PAGES REMOVED

Pigs and Paper

WHOEVER would imagine that there could be any connection between pigs and paper? No one—and there isn't any. However, there is an analogy between the pig-product situation and the paper-product situation in one point only, and it is that point which we propose to stress; namely, a drastic domestic shortage of pig-products and paper-products exists to-day

You, dear reader, will recall that a year or so ago, there were destroyed by political administrative decree and direction, some six million little pigs and their maternal relatives. This piece of hogology was primarily responsible for the shortage of pig-products in the United States, but it did not produce as a result a famine of hams, bacon and pork products. For just as soon as the pork scarcity began to pinch the domestic consumer and distributor thereof, foreign pig-products immediately entered the country in constantly increasing volume (now aggregating millions of pounds monthly) relieving the domestic shortage. But for the ample supplies of pork products shipped from foreign lands, where pigs and their mammas were not taboo, to the United States, where pigs and their mothers were taboo, there would have been a pig-product famine.

To the rank-and-file consumer in this country, a slice of Polish ham tastes just as good as a slice of American "ham-that-am," providing it costs him no more. That he gets foreign ham and the foreigner gets the American money is of no consequence or concern to him and, of course, is not germain to the pigs and paper story. So, we'll skip it and go on to paper.

There is an acute shortage of paper in America to-day. It is proportionately as great as the shortage of pig-products with this difference. Whereas the pork shortage is being relieved by the huge importations of foreign pig-products to satisfy the growing demand, there is no chance of a huge increase of paper importations into America to supply the hugely increasing demand and to relieve the drastic shortage. So that as a consequence, the American consumer is right now brought face to face with the world-wide shortage in paper which will shortly become a famine.

Of course, the shortage of paper was not occasioned nor preceded by any political administrative decrees, or direction, destroying paper-making raw materials or crippling related processes, but it was occasioned by an economic condition none the less forceful and drastic and one which admits of no administrative relief.

There just happens to be at this time a concurrent conjunction of two major forces in business economics—a world-wide shortage of wood pulps, without which volume production of paper cannot be increased, and a world-wide continuous demand for paper products which, at this writing, appears to be unsatiable—at least for some time to come and already taking the aspect of a genuine paper products famine. In terse terms, there is a huge, elastic demand for paper and a short, static production of pulp.

Never in the history of papermaking has such a tight condition existed. Never, in the minds of the nimblest witted nestors in the industry has such a contingency ever been envisioned. The apparent suddenness of the development is what makes the situation startling. As one large paper merchant recently wrote, "there is unsatisfactory turmoil in the paper

industry. We are all up in the air." Surely, "we are all up in the air" and we are destined to stay there for some time to come.

The situation is not improving production-wise, and as for the demand, it is becoming more and more insistent.

We have not experienced any deprivations yet. They are to come, and what a headache will follow in their train. Production of paper cannot keep pace with the increasing demands of one hundred and thirty million modern Americans for re-stocking, replenishment and re-outfitting, after seven long years of curtailed production investment, depreciation and obsolescence of production units. Seven years of curtailment cannot be covered in one year. "Action and reaction are equal." We hate to quote it, but it is worth thinking about.

"Pigs is pigs" and though they are not congenitally related, yet there does exist the analogy between their respective industrial situations as shown above. However, the pig-product problem has been relieved by foreign importations. There is no chance to relieve the paper-products problem by increased importations.

What's the answer?

Safety— a Good Business Proposition

IS THERE a mill manager, superintendent, engineer, foreman or workman who likes to see a fellow associate or workman injured? Most certainly not, as no sane individual possibly could get enjoyment from the suffering caused one by an accident.

An accident, in rare instances, however, if not too severe, might be warranted if it could but warm the cockles of an unsympathetic executive's heart. No doubt there are employees who would sacrifice willingly their own bodily comfort if through some minor injury to themselves they could arouse a human understanding of employee problems in the mind of the big boss and through it cause him to look upon his working force as so many human beings rather than pieces of chattel or machinery.

Seldom, however, would an executive be found where such an experience would be needed to arouse him. The average executive considers himself just one of the organization and he does everything that he can do or sees to be done to make conditions about his mill safe and pleasant for all employees under him.

Mechanical guards have been placed around hazardous locations about the mill. Good artificial lighting has been provided for the entire plant. A safety program of some kind has been put into effect.

Maybe all of this work, good as it has been and is, is looked upon as a necessary expense rather than as a good business proposition. If such is the case, it is believed that there should be a right-about face in point of view.

Safety work is not only humanitarian. It also is dollars and cents to the firm doing it.

The case is cited of the mill that had an accident cost of thirty-four cents per ton of paper. This mill, faced with bankruptcy and unable to meet sales prices of competing mills, found by its very desire to live that the difference between profit and loss was in the cost of its accidents.

Concerted action reduced its accident cost, first, in half, and later, to approximately one-fifth of its former figure. These savings were a life-saver. They permitted the mill to meet competition and to again become a going concern. An effective safety program paid in dollars and cents. It was a good business proposition.

A safety program properly conceived and properly executed will always pay dividends. Do not fail to get the most from the program in your mill.

When School is Out?

WHAT do the boys and girls of your community do to spend their time when school is out? Do they spend the summer vacation season profitably or do they allow it to just idle away?

There is an old saying that Satan finds mischief still for idle hands to do. This saying applies equally well to boys and girls as it does to grown-ups.

The boys and girls of your community, whether you believe it or not, are your responsibility. Their future is in your hands. What you do for them may determine the pathway which they will follow into the future.

Maybe now is the time to put into effect some plan to furnish them with useful and profitable part time work during the vacation season immediately ahead.

At least one mill, the Kalamazoo Vegetable Parchment Company, Parchment, Michigan, has found from past experience that a home works plan for community youth really works. In this case, Jacob Kindleberger, formerly president and now chairman of the board of the Kalamazoo Vegetable Parchment Company, started the movement. Both the boys and the girls of the community were organized and their activities directed by adults in position to give of their time to the work. The older boys, in one group, solicited and did odd jobs in the community—jobs such as mowing lawns, washing cars, cleaning basements, weeding gardens, etc. The younger boys, in another group, made and sold clothes props, bird houses, tow ropes, hose reels, and other simple and useful articles. The girls baked cookies and pastries, did simple sewing, cared for small children and served luncheons. It was a business proposition and was handled as such by the three different groups.

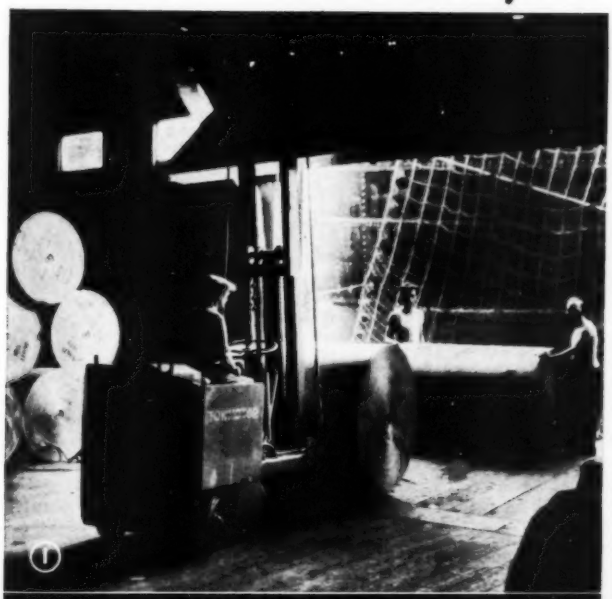
The plan worked and it has been put into effect during each vacation season for several years.

If you desire to profit from a similar activity, organize now and be ready for action when school is out.

TOWMOTOR CLEVELAND

HAULAGE EQUIPMENT SINCE 1919

IN *Paper Handling*



SCOOPING WITHOUT DAMAGE

TOWMOTOR straight gas operated — hydraulic lift trucks truly set a high standard of efficiency and economy in better paper handling.

Scoops rolls from floor level — without injuring the paper. Operator safely seated in full view of work. Mast tilts back at angle to hold roll securely. As the truck approaches the stack, the roll is elevated, then the mast is tilted forward under hydraulic control — and the roll falls to desired position on stack. Equally important is the fact that all operations are performed with one operator, with speed, safety and accuracy.

Dual tired driving wheels under the load to give better traction. Steering on rear wheels for short pivot turns. Load capacity and height of lift built to suit your requirements. Straight gas powered with unusually rugged construction throughout for greater dependability and 24-hour uninterrupted service. Lowest cost per year is the real cost. Give details of your requirements and we will send prices and specifications to cover.

TOWMOTOR, INC., 1222 E. 152nd St., Cleveland, O.

New York Office; 96 Liberty St., Phone: Barclay 7-3090
Los Angeles Office; Irving G. King & Co., 708 E. 6th St., Phone: Mich. 9256

CONVEYING AND ELEVATING

UNLOADING AND PLACING

GAS HAULAGE EQUIPMENT SINCE 1919

Back to Fundamentals

WILLIAM SIBLEY

DURING the early 1600's, Lord Chief Justice Coke of England, in deciding a case, established this principle: "The house of every one is to him as his castle and fortress, as well for his defense against injury and violence as for his repose." The principle that "a man's house is his castle" is firmly embedded in the laws and customs of this nation and is entirely in keeping with American traditions and manner of thinking. We have endowed this principle—that a man's home is his castle—with a deeper, fuller meaning than any other nation in the world. But we need to renew and revivify our appreciation of this principle, because . . .

Prior to 1936, anyone, or any organization, who violated that principle stood in high likelihood of being both persecuted and prosecuted. Prior to last November's election few, if any, divisions of our government (city, state or federal) would condone voluntary trespass upon another's property rights. Since that time, a scant half-year, conditions of thought and philosophy within our government have so altered that today we are faced with the necessity for returning, sharply and abruptly, to that fundamental basic principle.

There is small need here to recite instances of "sit-down" strikes which not only have violated our imbedded principle of right, but have destroyed the sanctity of such things as the U. S. Mail. Not only have a relatively few so-called "labor" leaders invoked the unwilling and hesitating acquiescence of workers in unlawfully seizing other people's property, but those same leaders have stopped mail trucks, interfered with mail delivery, prohibited the passage of the mail. And prior to last November, more than 120 millions of people in this country would have considered this a penitentiary offense. Yet our present government condones and tolerates such acts. Hence the need for all of us—every one of us—to return again to fundamental principles—the principle of "a man's home is his castle," exemplified by everything that is involved in the enveloping word: "*Americanism*".

Thinking and talking along these lines, four of the men in the advertising agency for which I work, recently spent some time recharting the fundamental principles of Americanism. One of the things which came out of that conference was "The Ten Commandments of Americanism," and I wish here to offer them for your serious consideration, and if you are an executive of a paper mill or pulp plant, with the great hope that you have them mimeographed, tacked on every bulletin board in your plant and stuffed into every pay envelope at the next pay period. The only request that I make is: that you type, or have printed below them these few words: "Copyrighted 1937. R-E-Y-F., Inc. Chicago." Here they are. Read them. Study them. Let them soak in. They will grow on you.

The Ten Commandments of Americanism

1—I am Americanism; thou shalt not have other isms before me.

2—Thou shalt not enjoy American rights and privileges without upholding fair play.

3—Remember thou and keep the laws of our country.

4—Honor the Declaration of Independence and the United States Constitution.

5—Thou shalt not riot.

6—Thou shalt not trespass.

7—Thou shalt not destroy.

8—Thou shalt not intimidate thy neighbor.

9—Thou shalt not deprive thy neighbor's family.

10—Thou shalt not confiscate thy neighbor's property.

If you should wish to give distribution to the above Commandments in accordance with my suggestion, here also might be something additional to print on the back of the sheet—without the necessity for copyright credit:

Some employers are unfair to their employees. . . . The great majority of them want to play fair.

Some employees are unfair to their employers. . . . The great majority of them want to play fair.

Refusing to pay fair wages is *not* the way to big profits. (Unfairness never works—even for the big boys.)

Going on a sit-down strike is *not* the way to higher wages. (Unfairness never works—for *anyone*).

Because a few employers refuse to play fair, we should not condemn the so-called "capitalistic" system.

Because a few radicals induce unfair strikes, we should not condemn all organized labor.

All fair employers should vigorously condemn the few unfair employers.

All fair-minded employees should vigorously condemn the few unfair radical labor leaders.

Regardless of who does it or where, the seeking of unfair special privilege by a minority is a direct violation of the liberties our American government guarantees.

When you seek special privilege, good or bad, against the wishes of the majority—by trespass, intimidation or confiscation, you are rapidly undermining the government which protects you.

There is nothing right about anything which is illegal, unfair or unAmerican.

ADVERTISING PAGES REMOVED

THE PAPER INDUSTRY

Forest Management . . .

A Challenge to the Paper Industry in the South

WINSLOW L. GOOCH, Forester
The Chesapeake Corporation

THE movement southward of many important kraft paper manufacturers offers to that region an industrial awakening rich in opportunity. But it includes, as well, a responsibility effecting the wise use of forest resources that should be recognized early by industrialists and public agencies alike.

We might pause and inquire into the attitudes and behavior of pulp and paper companies in other parts of the country as to performance in carrying through forest management plans, both before and after cutting, on company owned forest properties. That experience at least might be indicative of trends to be expected and which, to an extent, are now being applied by the same industrial group in the South.

Large scale consumption of pulpwood by paper companies in this country goes back only about 45 years. In northern climates this is hardly sufficient time for harvesting a second cut. Attracted by water power, many of the larger mills were located in wilderness areas close to an abundance of raw material where lands were cheap and extensive areas of forest lands acquired at certainly not an exhorbitant capital outlay. Most of the mills followed a policy of "cut out and get out" with the result that after 25 years of operation plants have become encircled with an infant empire of cut-over land. Pulpwood costs have risen due to constantly increasing transportation expense.

For a number of years, these close-in cut-over lands were forgotten. Rarely has there been carried through, aside from scattered experimental plantings, a systematic plan of forest restoration for large areas of cut-over lands. They have been left in the lap of Nature. Today much of this land has come back to a forest type of mixed species, including certain of the hardwoods that have a demonstrated limited pulping value.

In the past ten years there has been a revival of interest—interrupted somewhat by the depression—by the management of certain paper companies as to the contribution that close-in lands properly stocked with pulpwood tree species can make toward future reduced wood costs. The result has made for closer attention to silvicultural methods in cutting, in order to encourage natural reproduction, and to planting nursery grown trees.

In New England, good natural reproduction of spruce and fir is obtained by clean cutting in areas restricted in size where fire is kept out. In the Lake States in the past five years over 300,000 acres have been planted though not all of this by pulp and paper companies. In Wisconsin, particularly, the paper companies are behind an extensive tree planting program for their lands. On the West Coast, pulpwood is intergraded with saw timber logging and reflects in a way the larger timber management policy on those lands.

Farther to the South, climatic conditions are such that with longer growing season, resulting in more rapid maturity of tree development, the rotation period for producing pulpwood is reduced from twenty to fifty per cent. In Virginia, for example, the native pine reaches good pulpwood size in thirty-five years. In Georgia and Florida twenty-five years would suffice. These factors should make timber producing financially attractive and stimulate an ordered program of forest management on the part of those land-owning paper companies coming to the South. And this forest planning should apply with equal force through company initiative and sponsorship to non-company owned lands that supply wood located within the operating influence of established mills.

It is a matter of keen disappointment to those in the

forestry profession that certain mills now operating in the South are giving little or no thought to the future of forest land being cut over. Such an attitude of indifference means not only lost time in putting these lands back to work producing more pine, but it is the influence of poor example in right cutting and logging practice that would mean much by way of education and precept to farmer owned and other small tracts that increasingly contribute pulpwood to these same mills.

In thinking on these matters, the people of this country are reaching the point, and quite correctly, that because title is held to a piece of timberland or timber it does not carry the right to jeopardize the ability of that land to reclothe itself in a tree cover of comparable quality through employment of a ruinous system of forest exploitation. There is recognized the principle of social equity that those who follow after shall not be denied participation in the use of what Nature has bestowed as aided by man in his particular generation.

The South holds great promise of becoming the most intensively worked forest region in the United States with paper companies seemingly holding dominant position. And it appears as a matter of plain business foresight that raw material reserves be set up through acquisition of forest lands. Long time dependence on procuring more than partial requirements of pulpwood in the open market is hazardous business planning.

Management is simplified if in the selection of lands by a paper company, purchases are made in continuous areas or blocks rather than in detached or separated tracts. The latter plan may distribute the fire hazard but not necessarily reduce it. Ownership in large units would afford better control of this hazard since it puts the job of fire protection entirely on the company with results generally more satisfactory. In blocking any large acreage attention should be paid to the area-proportion and the distribution of tree age classes—merchantable, half grown and small trees. While theoretically these should be proportioned rather evenly to meet annual mill requirements for a twenty-five or thirty-five year growth period, yet if a company is going into land ownership to be self sustaining, or even partially so, under conditions now existing in the South, fully seventy-five per cent of land acquired should be stocked with merchantable pine. In the ensuing years, purchases can apply to lands supporting half grown timber and a small proportion newly cut-over. Of cut-over lands there should be a constantly increasing supply with the passing years with values fairly low depending on how they have been left. It will require perhaps a full timber rotation period, or longer, to make these age-class adjustments, but once established and the land given efficient fire protection, a minimum of insect and disease loss plus proper climatic behavior, a paper company's pulpwood supply can henceforth be produced on a crop or "tree farming" basis.

To approach a limit where a company should feel reasonably secure in a pulpwood reserve, a minimum of 1000 acres should be owned for each ton of mill capacity. In the deep South where annual woods burning has kept down pine reproduction and the merchantable stands over extensive areas are open—not more than 5 cords per acre—the above ratio would be insufficient. Not until these thin stands are removed and the land put under more intensive forest production through elimination of fires, natural seeding or planting, would these figures be adequate.

On the matter of annual growth increment per acre for forest lands in the South, it is low, probably as an average, less than a cord per acre per year. Outside of turpentining areas, this increment would tend to increase due to reduced damage from fire that would favor a fuller stocking of the land. In the case of Loblolly or Slash Pine on good sites with land rather completely stocked, this increment can reach as much as two cords.

The width of annual growth ring has an important bearing on pulping qualities. We hear some fanciful tales on the extreme rapid growth of our southern pines. There are, to be sure, "museum" or specimen trees that show rings three-fourths to as much as one inch wide through much of their age history. The springwood in such a wide ring if "dehydrated" would have perhaps the wood fiber content of a ring half that width or less. Growth rings up to three-eighths and certainly one-half inch in width have reached a size that represent greatest pulping efficiency. And this is reasonable fast growth—two times as fast as northern spruce. So too rapid growth of pulpwood is not to be desired.

As a group, southern pines—Loblolly, Slash, Longleaf, and Shortleaf—reseed open land naturally and abundantly if the ground cover or "rough" is not too matted and sufficient top soil is exposed. There are intermittent years when this seed production is heavy and at such times full advantage of this low cost means of resetting open land should be taken advantage of. In viability, the seed of all four species rate high—nearly seventy per cent average. The seeding ability of these trees is a great asset in management of pine lands though it should be frankly admitted its effectiveness is not always realized due to the conflicting pranks played by both Nature and man. Cultivated lands that are turned out, if not too far from sources of seed supply, restock easily. Strong winds will carry the seed from pine a quarter of a mile or farther except Longleaf that bears larger and heavier seed.

This seeding capacity in some sections has become greatly impaired due to "distress" cutting of the older trees during the depression years. In Virginia, this is noticeable in Loblolly pine where old time boundary line trees have been sacrificed. In their passing, the natural balance that maintains pine over hardwoods has been upset. Close study of the reseeding effects of pine for a given locality should be

(1) Sample loblolly pine seed bed, King and Queen C. H., Va. (2) Forest nursery, The Chesapeake Corp., West Point, Va. (3) New Kent School forest and nursery used by high school students for instruction in forest management. (4) Forest window, demonstrating selective cutting, Richmond-Williamsburg Highway, New Kent Co., Va. (5) Typical scene in eastern Virginia showing land denuded of loblolly pine. This area was cut clean in 1929 leaving no opportunity for natural seeding of pine. (6) Pine land recently cut over, no seed trees left and hardwoods take possession for many years. (7) Seed trees loblolly pine left after cutting, winter of 1935-1936, Chesapeake Corp. lands, King and Queen County, Va. (8) Loblolly pine plantation. Trees spaced 5x6. Planted in 1929, Dinwiddie Co., Va.

made. If these be found favorable, instruct your woods foreman to leave standing four to six seed trees on each acre of ground cut-over—trees with plenty of burs or cones in tops. Man can help in this seeding process by disking or dragging the surface in the Fall before seed-shedding has started and in this way will be prepared a seed bed that increases germination the following spring.

An axiom in the handling of pine lands where an annual cutting allotment has been established is provision for prompt re-treeing of the land cut-over. Ground allowed to go unattended for several years after cutting, invites undesirable tree species to come in. These trees, mostly hardwoods, clutter up the land and because of annual leaf fall and shade it is more difficult for pine to become established. Lopping and scattering of brush followed by controlled burning (emphasis on *controlled*) is becoming recognized as sound silvicultural practice. This clears the ground of debris and litter and paves the way for increased seeding. Before burning, construct wide pathways around the area, remove brush near seed trees and have plenty of help when starting fire. The best time for this is late summer or early fall.

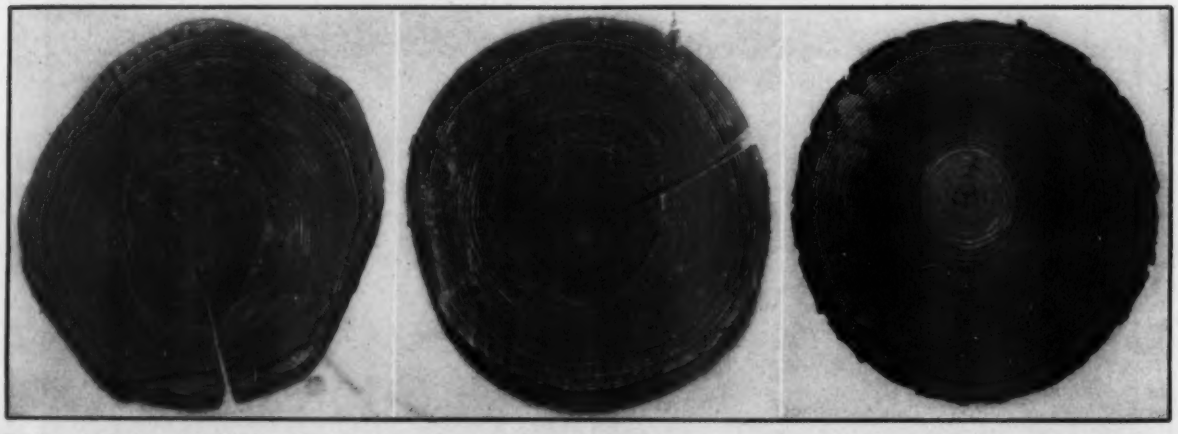
Planting of trees has many distinct advantages. One can select his own variety of trees and place them where Nature will not. Planting provides for even-age stands, uniform stocking and gives to the land, in fact as well as appearance, order and control. No over or under stocking as is generally Nature's way. Further, the trees are eight to ten inches tall which put them off to a good growing start the first season set out.

The proper spacing for pulpwood is about 5½ ft. by 5½ ft., which gives 1480 trees to an acre. This slight reduction over the conventional 6 ft. by 6 ft. spacing has the advantage of stimulating height growth and at the same time maintaining body in the stem. Such a planted acre will reduce to about 200 trees when ready for cutting and these should have good basal girth carrying volume with moderate taper well up into the top of a tall tree.

South of the Mason and Dixon line, the cost of producing pine seedings in a nursery is considerably less than in northern states since they are sufficiently advanced after one year in the nursery to take care of themselves when set out on permanent growing site. In northern nurseries this time is at least two years and possibly three depending on use of seedlings or transplants. In the South, pine planting stock should be grown for $2.00 per thousand seedlings and possibly less, if the need for weeding can be kept to a minimum. A planted acre should represent about $3.50 in investment cost.

A word might be said regarding preparation of ground and use of tools for planting. In the case of old fields with rank growth of broom straw, cleaning the ground by firing (this can be done in damp weather to permit slow burning) is helpful before starting planting operations. If there is honeysuckle or other cover that does not yield to fire, the plowing of furrows is advisable. If the burning of brush on newly cut-over land is believed unsafe and the opportunity is poor for natural seeding, seedlings can be planted in row formation, making adjustments to the side as tops or other piles of debris are encountered. On land with young hardwoods established, the planting should be in openings without attempt at definite row formation. Experience has proved the maddock to be about the best tool for planting trees. There are several types of planting irons which eliminate the back-bending necessary when using the maddock, but the temptation is to spread the vertical slit-like opening too wide so that lower roots cannot receive soil contact by pressing, with the result that the tree may not survive.

Pulpwood being a wood crop grown in a comparatively short rotation period, the aim in management should be the production of the largest number of stems per acre consistent with as much volume as possible on each tree. A periodic thinning out of the "laggards"—those with crowns overtopped or suppressed—at ten year intervals will stimulate the growth of the remaining trees because of saving in moisture and plant food. These thinnings, however, have questionable value for pulpwood unless they are truly suppressed trees in the sense that rings are close and compact and wood mature. The thinning process as expressed in the term "selective cutting" is more appropriate for it implies stand improvement of larger and older trees, the "misfits" of which are usually suitable for pulpwood. In sections subject to sleet



Left and Center—Slash pine showing slow growth. Right—Loblolly pine cross section. Not such rapid growth but good sulphate pulping quality. *Courtesy Forest Products Laboratory*

storms, care should be taken not to open up the stands too much. In Virginia, in recent winters, there has been much severe damage in immature stands from breaking of tree crowns, weighted with ice.

It might be well at this point to consider the economic basis for growing of pine.

Assume the value of a typical cut-over acre in Eastern Virginia to be $4.00; the cost of planting that acre (raising the trees and labor in setting) is $4.00; taxes, fire protection and supervision is thirty cents per acre per year. The interest desired on investment is five per cent and it will require thirty-five years to mature this wood crop for pulpwood.

The land, planting costs, taxes, etc., capitalized for thirty-five years at five per cent, amount to $71.22. At the end of twenty-five years, an improvement thinning of stand can be made that will produce six cords (Standard Cord of 128 cu. ft.) of pulpwood worth $3.00 on stump or $18.00. This income capitalized for the ten-year period short of the thirty-five years is $29.32, and this amount deducted from $71.22 gives $41.90, the gross capitalized cost. Subtracting the original land value cost of $4.00, leaves $37.90 as the net capitalized cost of growing the tree crop to thirty-five years.

That acre at the end of twenty-five years should cut twenty-eight cords of pulpwood. Dividing $37.90 by 28 cords, gives $1.35 per cord, which is the figure the wood should bring to return all the operating costs and pay five per cent compound interest on the investment for thirty-five years.

What the market value of pulpwood may be, looking ahead thirty-five years, cannot, of course, be determined with accuracy. Judgment can only be based on the present trends as affecting demand and supply. Within a radius of eighteen miles of a pulp and paper plant, it is believed an anticipated stumpage value of $3.25 is not unreasonable. On such basis, there would be realized a profit of $1.90 per cord over and above investment cost or a total of $53.20 above this cost for the planted acre.

The South is fortunate since native pine is not subject to widespread killing insect and disease damage. The southern pine beetle and several kindred beetles, their work identified by borings in bark, do killing at times but area of infestation is local and generally confined to not more than a few acres. The Nantucket Tip Moth is found over much of the South and affects small pine sapling trees by destroying the apical bud causing a temporary vertical deformity of the tree. After two or three years, a new leader is developed and the tree returns to its normal straightness. In parts of the South during several recent seasons of long continued drought, the pine, over extensive areas, developed an unhealthy off-color appearance that caused much concern among wood users. The condition proved to be a root fungus that started as a result of drought and with the coming of winter rains disappeared bringing the trees back to their usual vigor.

The contribution that the public agencies such as State and Federal governments are making, particularly in fire protection, throughout the South should be intensified and receive the whole-hearted co-operation of forest land owners. If uncontrolled, and without purpose, fire leaves in its path great economic loss. Fire if not entirely consuming in its effect on the tree (and southern pines because of thick bark offer much resistance to killing) will slow up normal rate of growth for many years. Education and more of it with good example set by industrial forest users will go a long way toward correcting the ingrained custom of annual woods burning.

Also, the co-operative hand should be extended to the Federal Forest Experiment Stations that serve the South. Located at New Orleans, La., and Asheville, N. C., the research and investigative work of these stations reaches out to all parts of the South. Their problems as related to timber growing and management are your problems. To coax from Nature the answer to a silvicultural question may require years of observation and use of a piece of forest land. The men on their staffs are highly trained specialists and they are at your service at all times to consult and advise.

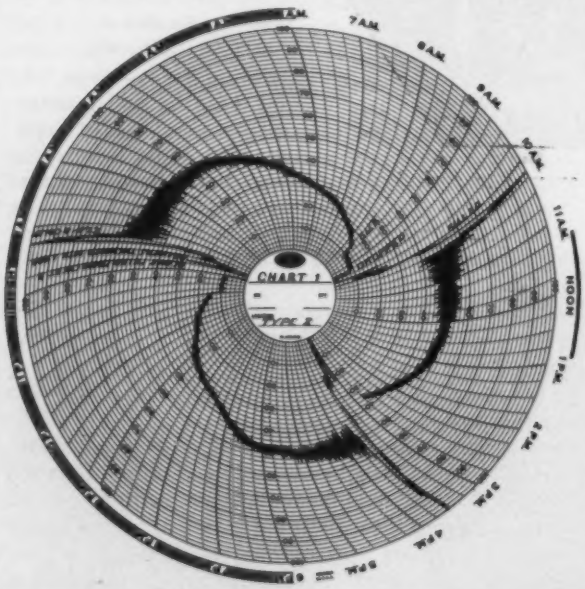
So, in conclusion, it may be said that Nature has endowed the South with unexcelled timber growing opportunity. There will have to be put forth much corrective effort to off-set the abusive treatment for years accorded southern woodlands if full advantage is taken of favorable climatic factors. Pine at present is in the forefront of the industrial picture. If immediate self-interest is to dictate land management policy, and this seems to be the viewpoint of several paper companies already operating in the South, then good old timber mining will have full sway. But remember, our old friend Public Opinion, while perhaps a little slow in becoming aroused, is pretty definite in his judgments. And he may, one of these days, issue an edict that forest destruction must stop and in its place will come intelligent forest planning.

Added Notes on the Running of Beaters

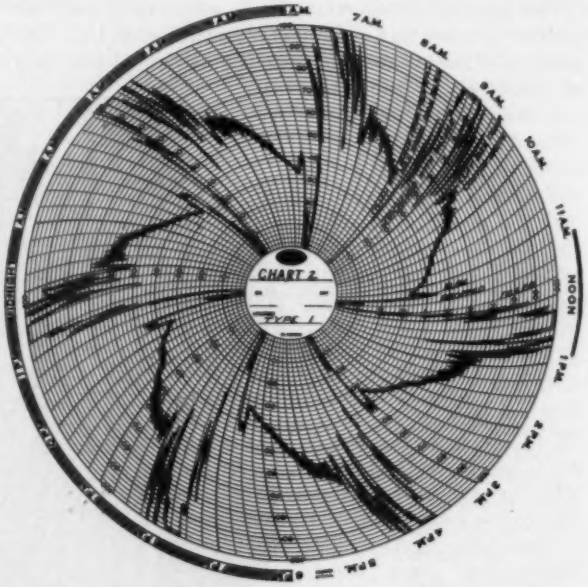
ARTHUR B. GREEN

IT MAY be worth a note, for its bearing on the design of stock treating machinery, that in an ordinary beater when the roll is left in one adjustment the effect on the stock is not steady. Scanning the charts exhibited in a former article (Cf. THE PAPER INDUSTRY, Feb. 1937, Pages 930-936) there is evidence of this. In all except the last, the drag curve starts almost horizontal, and it takes an interval of time before the work of roll on stock begins to tell. That fact is the more impressive considering that the curves do not start with the beginning of roll action. Now tracing the curves farther, there are descending curves which concave upward that correspond with unchanged roll position. This continues for some time, when the curve turns downward and starts another scallop, or cycle. Not shown with these papers is evidence gathered in course of a run of thirty hours on one furnish with one roll adjustment, where the drag curve descended in a series of waves.

If the stock were changing always proportionally with the work of the roll against the plate, these drag curves would be straight lines with uniform rate of descent. This departure from that form has significance for the designer. It shows a factor of stock treatment not always given its due force. The beater works away for some intervals of time, often for more than an hour at a time,



with no appreciable effect; then, without a change in mechanical work, the stock begins another period of yielding. The designer who makes his stock treating machine to do specific mechanical work can be seriously disappointed if he catches the stock in a condition which corresponds with one of these retard periods in the treatment curve, and there can be little doubt that here is an explanation for the occasional failure of continuous stock treating machines which are made to give instantaneous action while the stock passes through



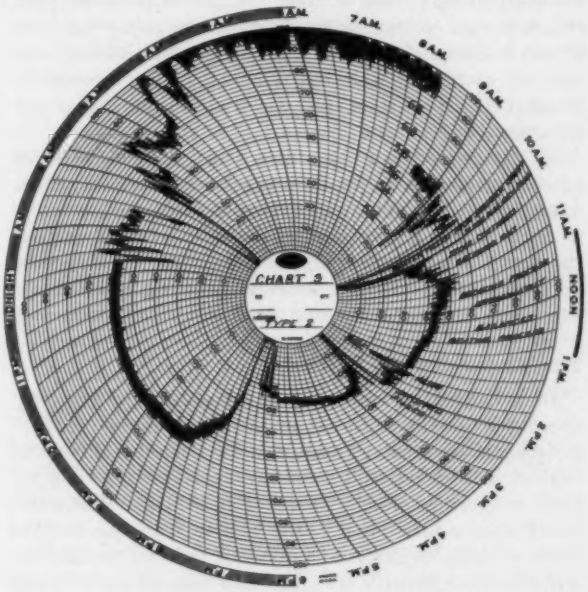
once. We have here in graphical form what many practical men have encountered and some of them recognize; namely, that there is an important time factor.

Not always the same, not always calling for the same allowances, this time factor always exists. It means in practice that after the stock has been hit by the knives or bars it takes time for the papermaking effect to develop. During that time, the stock may or may not be undergoing further punishment, but it remains a mass of slush, and no doubt the time is consumed in letting water come closer into contact with fibers and with new fiber surfaces exposed by the treatment. If paper making qualities are also developed by chemical, magnetic, or gravitational forces, time allows their effect also to take place. This factor is given place in the ordinary design of the open tub beater, in the novel design of the recent "Tug Boat Annie," in any design which couples a mechanical action with a reservoir for soaking, as is the case with the Stobie design. In any design of stock preparation equipment it cannot be assumed that the mechanical action is effective immediately, or that a given action will prove effective, and the customary calculations of knife-cuts and pressures cover only a portion of the job.

A Cotton Furnish

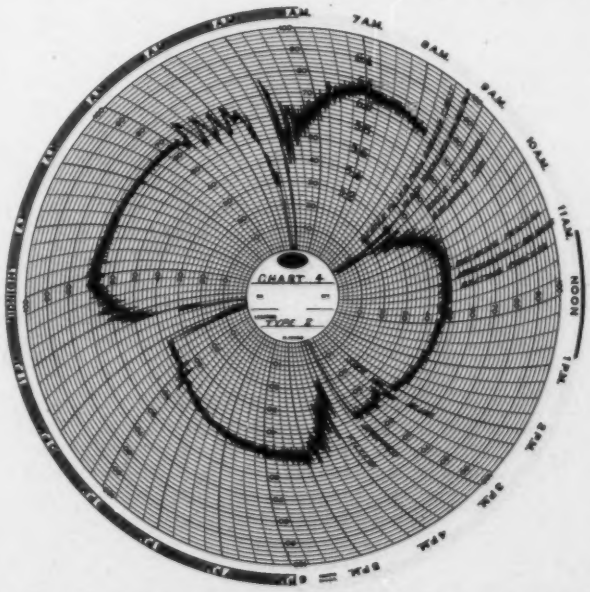
In the nine-hour beating periods shown by Chart 1, the furnish was cotton rag and bleached sulphite, 80

per cent cotton, and the beater roll was progressively set down. (1) At the start, the temperature was 51 degrees Fahrenheit; at the end, 87. The beater is a good mixer. Though the furnish was largely by hand, the curves show no thick and thin portions regularly repeating, and the width of the curves tapers down de-



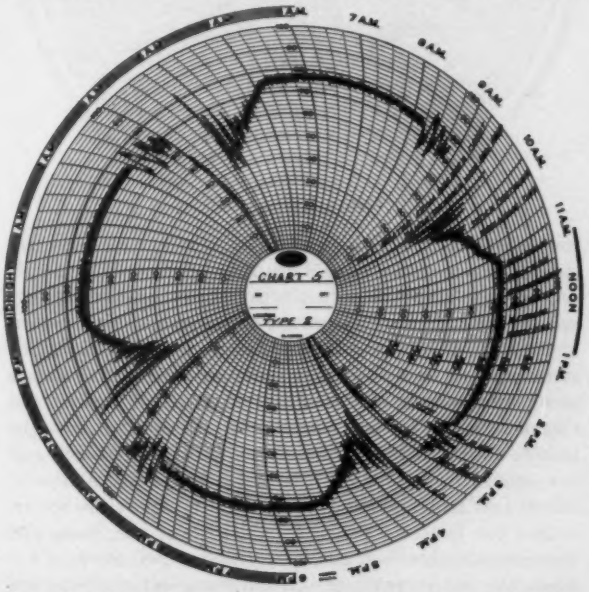
cidedly as the beating progresses. It required a little more than one-half hour to complete the furnish, including clay and color. Schopper-Riegler freeness went from 735 to 470; Automatic freeness from 25.2 to 9.4.

The beaters have no washers. The stock is thickened



by adding laps. To bring the beater control curves out to uniform starting points, which are about 52 on the chart, required a nice piece of work on the part of the operators. They had the beater control indicator to watch, and with some practice they could manage the furnishing operation through its forty-minute duration so that the control curve came out to its uniform starting point and the beaters were filled to uniform height. From that point onward, the roll is then handled so as to make the control curve follow a predetermined form. When the indicator shows a reading a little above the pre-determined curve, the roll goes down; when the indicator shows above the set curve, the roll is left untouched; these readings the operator makes at set intervals through the run and corrects the roll setting accordingly. In this way the operator is guided solely by the effect on the stock. Cotton that has been in the drainer a long time beats out differently from cotton which has drained less time. Besides that, there are other variables in both cotton and sulphite which affect their rate of yield to beating. So long as the operator is guided by the effect on the stock, he varies his roll adjustments to compensate for the variations in beating characteristics coming up to him in the stock. By this method, beating is done to specification.

The chemicals are also added to specification. At the

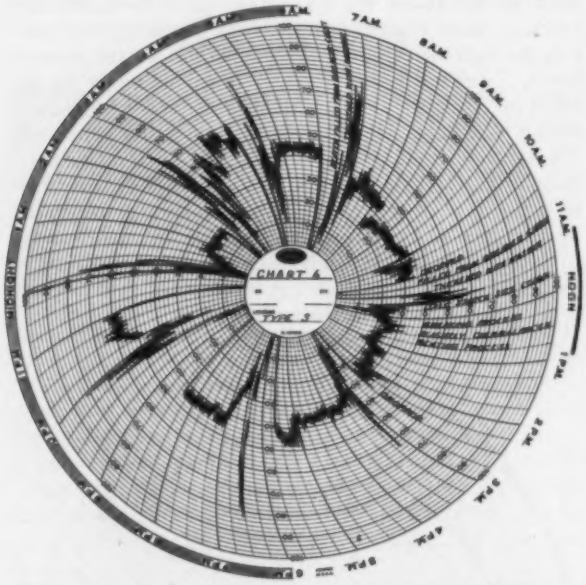


end of each of these long curves is a drop of some fifteen points. That was made by adding size. If it is desired to have size go in at a specified time, the chart shows the operator when that time arrives, shows him whether he has added his size or not, and passes both bits of information along to the management every day. By the extent of the drop in the curve, the operator and the management both know the amount added. And there is no danger of double sizing, as sometimes occurs when the operator is in doubt and decides to play safe.

A Book Furnish

Fully as skillful a job of furnishing is presented in Chart 2. The stock is bleached and unbleached sulphite, bleached soda, coated and uncoated mill broke from a pulper, and a heavy loading of clay. The beaters have washers. Like size and color, the clay and clay-coated mill waste may not be added until the washer is up. So the procedure begins with two levels established in the tub, established to serve for the order. Bleached sulphite in slush is run in up to the first level,

and unbleached sulphite in dry sheets fed in on top of that. Bleached soda is then run in up to the second level, which represents the filled tub. Uncoated mill waste from a pulper is fed in on top of that. The washer is down. Bleached soda slush is run slowly while the washer takes out water, so as to keep the tub filled to



the established full level. This process thickens the mass and sends the control reading up. When the reading reaches a specified point, the slush soda is shut off and the washer raised. Thus the density and total amount of fiber so far put in is fixed. As the very thick body of stock just in front of the washer moves on and passes the beater control, the reading mounts still higher. In Chart 2 it goes beyond the limit of the chart. Now the clay is added in water suspension, size in emulsion, and the coated mill waste. The stock is traveling slowly. These last additions are localized. It takes time to circulate the beater enough to smooth out the mass and stop the saw-tooth portion of the control curve. (*2*) Thus the entire process of furnishing takes about one hour, and the roll is set down when the thickening begins, or about fifty minutes before the furnish is completed.

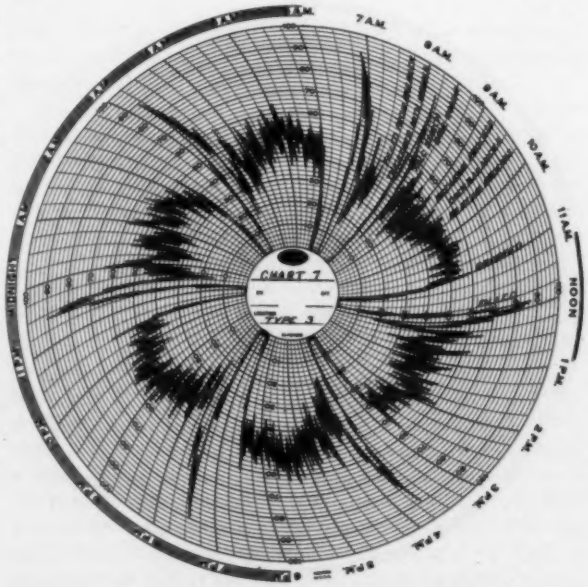
Beatermen are pushed by the desire to get the chest full and to keep ahead of the machine, hampered by failure of materials to arrive as needed, and they have nothing in front of them to show the consequences definitely. They are left to their own devices, their work not organized to be done in the simple methodical way. These beaters prior to control showed densities varying from 4.1 to 6.9, and that was, by comparison, good mill operation. Chart 2 shows the record of densities varying from 6.4 to 6.6.

Looking at the steeply rising line at the very beginning of each run, we note that there is a notch at about 87 in each case. It was at this point that the soda slush was shut off and the washer raised. This was a specification. But for the management to look at that notch in the curve and feel that the thickening had been done correctly would be unsafe, for a number of things might put a notch in the curve. What really tells is the point at which the curve finally straightens out an hour later. That a beater crew could manage the furnish, which in this case was complex, so as to come out an hour afterward so uniformly is surprising, but experience shows that when ordinary men are given good tools to work with and good methods to work by they are glad to make use of them. Chart 2 presents part of a sequence of furnishes that kept one paper machine within trade customs as to ream weight and within commercial match as to color, size, strength, formation, finish, for a period of ten days while one order was running.

At the end of each run there is a little rise of some nine points in the curve. That is made by adding alum. Alum affects the curve in reverse to size. Size went in with clay right after raising the washer. Hence, whether the chemical addition is size or alum, the curve records it, and neither the operator nor the management is ever in doubt.

The Beater and the Breaker

In a converting mill which purchases pulp in dry sheets and disintegrates it in breaker beaters, we have a division of stock preparation between breakers and beaters, a division, that is, of the work prior to refining. Such a division affects Charts 3, 4, and 5. When this kraft stock comes down to the beaters from the breaker chest it contains sheets of unbroken pulp up to one inch wide, and the density is under such manual control only as a man may exercise by using his eye. The density is below the desired beating density, so a stock of dry pulp sheets is supplied to the beater room for thickening. There are no washers. The beaterman, too, has only eye control. That is the condition which produced Chart 3.

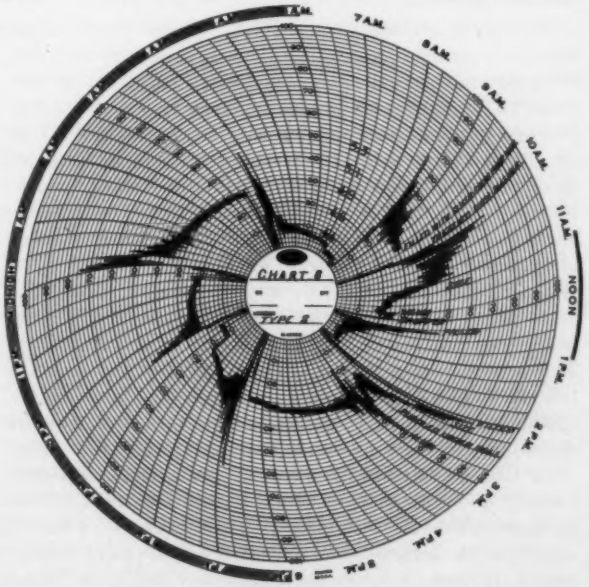


Because Charts 3, 4, and 5 all represent the same beater and the same stock, the scale of beater densities can be set down. Because the changes wrought in the stock during the beating period result in a nearly level curve, the height of that curve on the scale can be taken to represent the beater density, instead of a selected

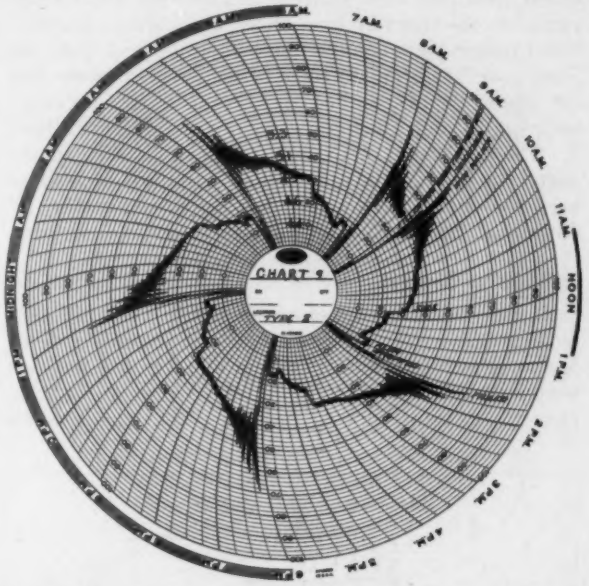
critical point of the curve as is more usual. Thus the Chart 3 densities vary from 5.1 to 6.6. And the beater control is sensitive enough to make that variation look shocking.

There are other bits of good information on Chart 3. The beating period varies from four to seven hours, another example of the effect of leaving the beaterman to his own devices in another mill rating high managerially and financially. Again, notice the speed of travel of the stock. That is seen by looking first at the saw-tooth part of the curve at the end of a run, when the size in soap form is put in and later the slum in dry form is added. These two come nearly opposite each other, for the beater turns about half way while the man goes to deposit his empty size pails and bring back his filled alum pails. Size and alum, as we have seen, affect the control curve oppositely. Every time the puddle of size comes round there is a valley in the curve; and a peak for every time the alum comes round. Until the beater has turned enough times to mix them, these peaks and valleys record the speed of travel. Chart 3 shows a slow speed, even at the end of beating, a matter of about fifteen minutes for one circuit of the tub. In the case of the heavy beater beginning at 2:00 A. M., the beater was so nearly "plugged" in the process of furnishing that at one time it took all of an hour to turn once.

Chart 3 contrasts sharply with Charts 1 and 2, which represent quite different stocks, by rising at the beginning of the run instead of descending, and by failing to descend very much thereafter. That results from the division of pre-refiner work between the breaker and the beater. The fact is that the beater is completing the breaker's work. Visually, the observer would see the small scattered sheets of dry pulp disappear after a



time. Under a glass he would see still smaller bundles or clusters of fibers remaining even to the end of beating. The stock scarcely reaches a state beyond what might be called oatmealy. What is happening, and what the curve reveals, is the resultant of two actions. The first is disintegration or fiber separation, which presents a very rapid increase in the number of surfaces open to water, free to increase the frictions within the stock mass. That opening-out action runs the control curve upward. The second action is the beating action, comprised under the general term "hydration," which, if applied to fibers already separated, would impart



strength and other paper making qualities to the final sheet. That second action runs the control curve downward. In Chart 3, the first action overbalances the second at the beginning of a run, and the two are in approximate balance thereafter.

That this reading of the curve is not fine-spun, we have the other common evidence, which is not otherwise to be explained, that through a four or seven hour run the speed of travel does not noticeably increase. What is called hydration, when it occurs alone, runs up the speed of travel in an open tub beater with constant roll speed.

Charts 4 and 5 show the same curve characteristics, but progress toward control. In Chart 4 the variation in beater densities had been brought down to 5.5 to 6.1, a substantial gain in uniformity. The breaker operator and the beaterman do not work within sight of each other. Under the conditions of Chart 3, when things got bad enough, and the boss landed on the beaterman for a reform, the beaterman would then go and find the breaker operator and take it out on him. Neither of them had anything more than eye control. The interval, amounting to several weeks, between Chart 3 and Chart 5, is represented by Chart 4, and in that time the attention of both breaker operator and beaterman was being focused on the beater control. With a lag of half his tour between the breaker and the beater, the breaker operator was getting accustomed to gauging his work by the result as the beater control showed it. He had his eye in training. His judgment improved as he found he had something he could check it by. As long as he delivered a nearly uniformly thick stock to the beaterman, the beaterman on his part had a narrower range of error to correct for in thickening up with dry pulp, and accordingly less variation in the amount of dry pulp

that the beaters had to accept for disintegration. Moreover, having a beater control to indicate and record the joint result for the two men left them with less ground for disagreement.

When enough time had been allowed for such a change in six men, the management began to specify what beater densities were wanted, and showed that specification on the chart by two circles, as shown in Chart 5. The breaker operator and the beaterman had then the joint task of bringing their work between these two set limits, which resulted in keeping beater densities between 6.0 and 6.2, for the order running with Chart 5. The beaterman, with more uniform material in the beater to work with, soon fell to handling his roll to keep the curve nearly level, leaving to the battery of Jordans in their turn a more uniform work to perform.

A Shift in Control

A very similar mill set-up results in very different looking beater control records, Charts 6 and 7. This is due in part to the management's preference for high beater densities, in part to shorter beating periods, in part to different type of beaters. Both these charts show the same characteristics as Charts 3, 4, and 5, but the beaters are left with more disintegrating to accomplish and the rolls are used to the limit of their weight throughout every run. The kraft, too, is of a tougher grade, to make a wholly different kraft product.

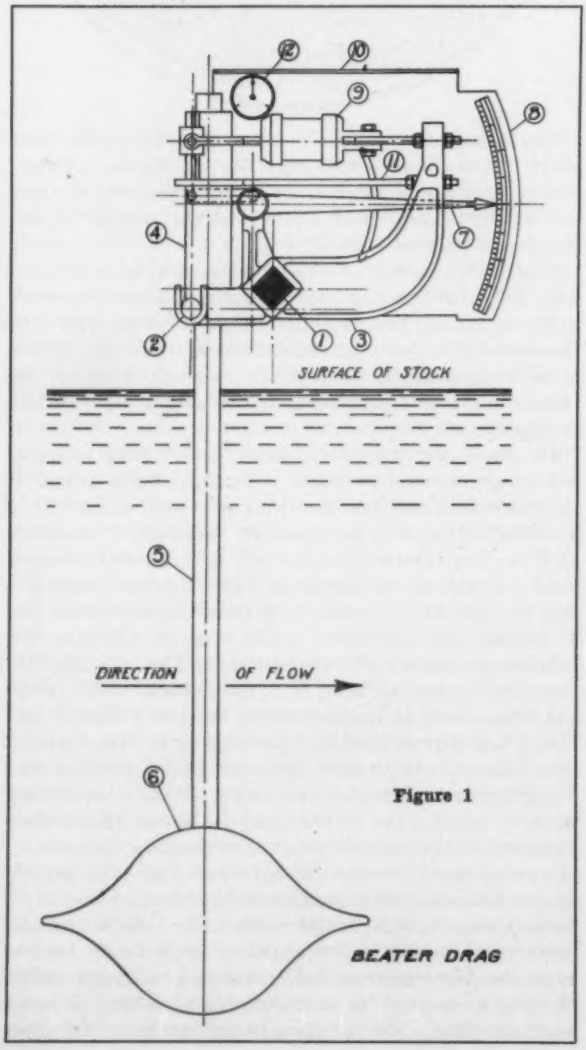


Figure 1

Through this short average beating period the freeness changes only slightly, on the order of ten seconds by the Skark test, or six points by the Automatic. At the end of beating the stock is often decidedly "oatmealy." As the beater densities are run high in proportion to the stock-propelling power of the beaters, the speed of travel is low, and when dropping there are lodgments of stock untouched by color or beater roll. Dependence is had on the battery of Jordans to smooth out these uneven conditions, and the mill is known for a high quality of output.

Chart 6 represents the operation prior to control. Chart 7 represents the operation assuming that all furnishes were uniform with three made during the day. The beater control was applied on one beater only. The purpose was to record and evaluate the variables with which the beaters were dealing. The result was to show that beaters were acting as breakers, and Jordans were doing the work of developing the stock for the paper machine. To set up control at the beaters would involve so much in the breakers that for the short beating time it would not pay. Hence, the question of control passes here to the Jordans, and embraces control of both density coming up to the Jordans and Jordan plug adjusting to fix the paper making quality of stock issuing to the paper machine. Passing on to the Jordans, the problem passes beyond the scope of these notes, and Charts 6 and 7 serve to show the survey value of beater control records.

Kraft in Slush

Passing from Charts 6 and 7 to Charts 8 and 9, we pass from an average beating cycle of 3.8 hours to one of 4.4 hours, not a remarkable change in time, but a very remarkable change in beater control records. Curves that are immediately descending show strikingly that here the stock is ready for beating, that the beaters are doing development, instead of disintegrating, work. Promptly tapering curve lines show that the beaters are mixing, that at the end of beating the stock mass is homogeneous, all parts very equally touched by color and chemicals and roll. Peaks and valleys follow each other in cycles of seven or eight minutes at the start of beating, instead of cycles of twenty or sixty minutes. The beaters are turning. These cycles run closer in time as the mixing proceeds and the cure line narrows, showing that stock frictions within the mass are decreasing, which is the sign that hydration is under way.

In Charts 8 and 9 the stock is again kraft, this time coming in a slush line from a sulphate mill to the beaters, where it is thickened with washers. Chart 8 presents the record when things are left to the beaterman's devices. Curves show radically different slopes, an indication that exceptionally variant qualities are developed. By reference to the previous article, "Notes on the Running of Beaters," (Cf. THE PAPER INDUSTRY, Feb., 1937) it will be seen that burst, fold, shrinkage, in their development under beating run consistently with the beater control curve, that duplication

of this curve in form duplicates closely the paper-making qualities inherent in the beaten stock. By that yard-stick Chart 8 shows variants in papermaking quality. What they amounted to by measurement, the mill afforded no opportunity to determine, except that variants did show in the machine room sufficiently to make quality control of stock important. But Chart 8 did show beating cycles varying from one and three-quarters to five hours, and beater densities varying from 4.4 to 5.3. Chart 8 shows, too, that the beaterman was free to add size and alum at any time, that whether size or alum had been added at all depended on his memory. Chart 8 records one furnish where the density was in the upper range, with corresponding slow travel, and the size was put in too early. It puddled under the roll. Circulation halted. Circulation was not restored until the beaterman threw alum under the roll. Thus alum was in early, too, and the control curve was exceptionally flat. Chart 8 does not represent bad beater room operation, as beater rooms go, but from the standpoint of economy and uniformity it shows enough.

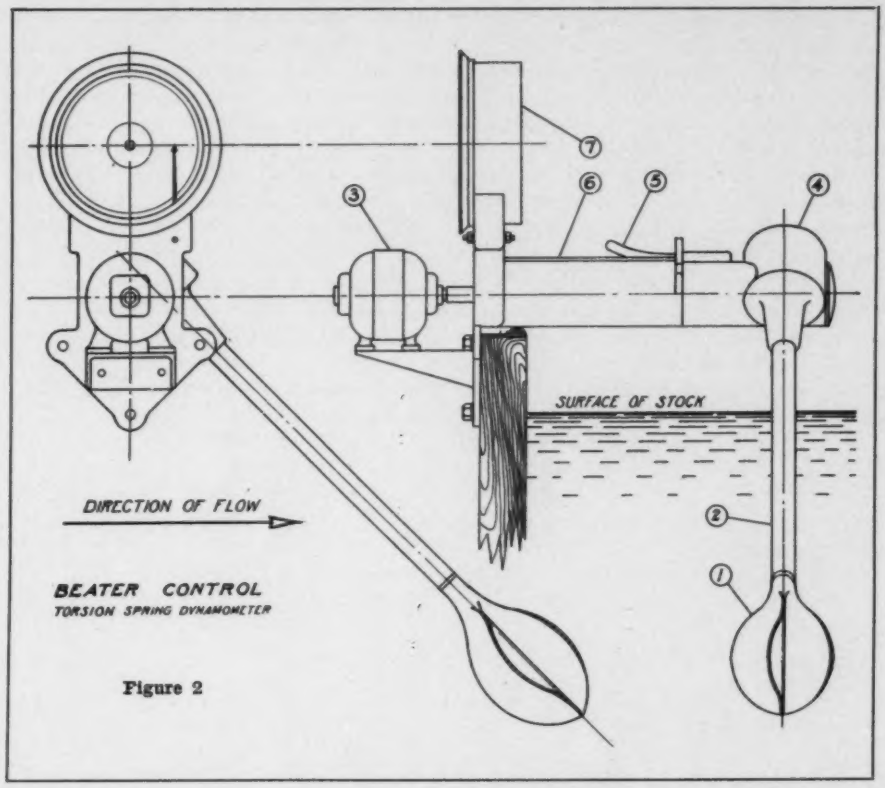


Figure 2

Under the conditions of slush from the pulp mill with washers to thicken with, the beaters are well under the control of the beatermen. Beatermen got accustomed to beater controls quickly. Between Chart 8 and Chart 9 there are only three days. In Chart 9 will be observed uniform beating periods, uniform beating curves, uniform routine with size and alum, and beater densities that vary only from 5.3 to 5.4. The actual tests by the mill laboratory presented the values as 5.30 to 5.38. Before control it took more than seven furnishes per day to keep up with the paper machine. After control it took a little more than five. The difference is on the order of thirty per cent increase in beater capacity, coupled with a corresponding decrease in beater room labor, and no change in other operating costs. It is over the long haul that the most important gain develops, when time has proved to the trade the better uniformity that a mill produces, and an alert sales force turns this to account in price level or volume, or both.

Control Measurements

To carry out in practice the principles of control it is necessary to measure continuously the changes in friction within the stock mass. This it has been seen provides a guide to the beaterman which he follows and produces a predetermined form of curve, and the form of curve fixes within close limits the resulting paper making qualities as developed by beating. For such continuous measurements there are beater controls in three main types. They apply under different mill conditions. Each is subject to modification in form and dimension as mill conditions require. The earliest type is the beater drag. (3)

The beater drag depends on the travel of stock past it. A journal (2) in Figure 1 is supported over the stock about midstream, in this case by a square shaft (1) spanning the straight channel of the beater tub. The flowing stock exerts a pull against an obstacle (6) which is met and balanced by a compression spring in a spring case (9), and the deflection of that spring is thrown up to large scale by the pointer (7) against the scale (8). These deflections are automatically recorded in the recorder case (10). A one-hand clock (12) times the periods when the operator takes his readings and corrects the adjustment of the beater roll. The obstacle (6) is formed in various ways, under various stock conditions, but usually is formed so as to emphasize the internal friction of the stock mass rather than the skin friction. The beater drag requires constant speed of beater roll. When the obstacle (6) is properly designed for the job, the decrease of frictions overbalance the corresponding increase of speed of stock travel, so that a descending curve results, and the trick of design is to make this descent as sensitive as possible for the classes of stock in question.

Figure 2 presents a type of beater control which measures the same frictions as the beater drag, but is independent of the speed of stock travel. A small

constant speed motor (3) drives a simple impeller (1) submerged to a fixed depth under the stock in a trailing position. Transmitting the power from motor to impeller is a worm reduction running in oil. The high speed shaft is made in two sections connected with a torsion spring. Changes in torque wind or unwind the spring, and that motion is carried through levers to the indicator (7). Whether the stock travels fast or slowly, the impeller turns constantly and the reading is substantially unaffected.

A third type is shown in Figure 3. Both the beater drag and the beater control with torsion dynamometer gauge the stock at one point. There are types of furnish, notably rag furnishes, where large dense chunks of stock remain localized and unmixed for hours. They cause wide swings of the indicator if the stock is gauged at one point. Figure 3 shows a wheel (2) of large diameter running in the same plane as the direction of stock travel, and with the travel. The wheel bridges gaps in the stock and averages their effect, so that swings of the indicator are reduced. Further steadying is had by means of a dash-pot (6).

There is a constant speed motor (1) driving the wheel (2) through a worm reduction enclosed in a case (3) and running in oil. The motor (1) is mounted on the gear case (3) and is counterbalanced by a weight (7). Case (3) is free to turn on the slow-speed shaft of wheel (2). As the torque increases, the weights (5) suspended rigidly from gear case (3) swing outward until the torque is balanced. This swing is transmitted to the indicator (9), thus giving the same measurement of changes taking place in the stock as are given by the beater drag and the beater control. For long beating cycles, over which ordinary measurements tend to flatten out, this third type of beater control is more sensitive, since there is more motion in proportion to the forces at play when the weights (5) are near their vertical norm than when they are lifted far from their norm and higher forces are at play. For long-fibered stocks in particular, this design affords the most sensitive guide for handling the beater roll during the last hour of a long beating period.

The nubs on wheel (2) are placed in such numbers and such form as give the highest sensitivity over the whole range for the stock in question. Usually this means emphasizing the internal friction of the stock mass rather than skin friction, but the wheel design is more open than either the drag or the impeller to skin friction.

Other arrangements are easily suggested. The housing arrangement of Figure 3 can be used for a beater drag such as Figure 1; or the pendulum dynamometer of Figure 3 can be used for a beater control like Figure 2. Between the three main types there is enough flexibility to meet any set of mill conditions, any class of stock or type of product. The point of most importance is that each mill is its own problem. The devices for meeting it may not be transplanted with success, but the principles may.

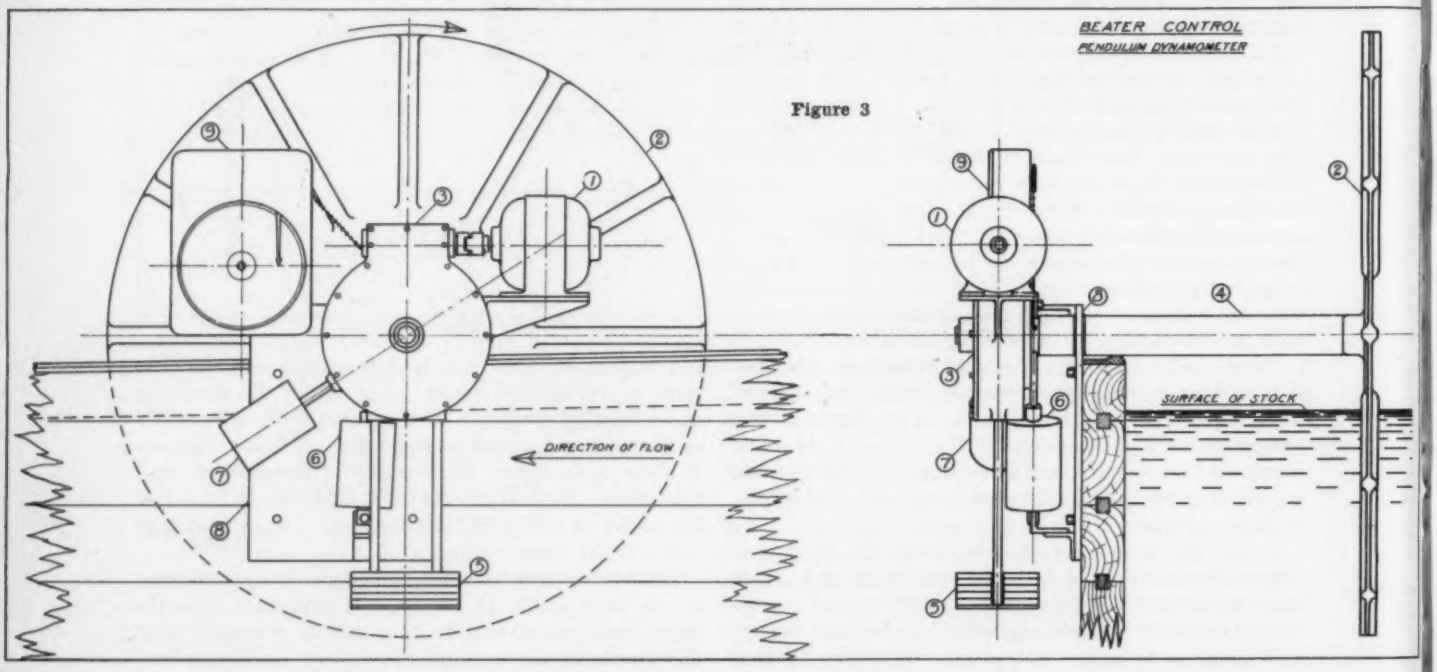


Figure 3

References

(1) Charts 1 to 9 inclusive are not originals. They have been carefully redrafted from originals for the following purposes:—To eliminate the identity of mills; to bring all charts to one scale for comparison; to present clean charts.

(2) Beater Controls are of three main types, keyed to the charts as follows:

Type 1, Beater Drag.
Type 2, Beater Control, torsion dynamometer.
Type 3, Beater Control, pendulum, or gravity, dynamometer.

(3) *Paper*, Vol. 19, No. 23, Feb. 14, 1917.

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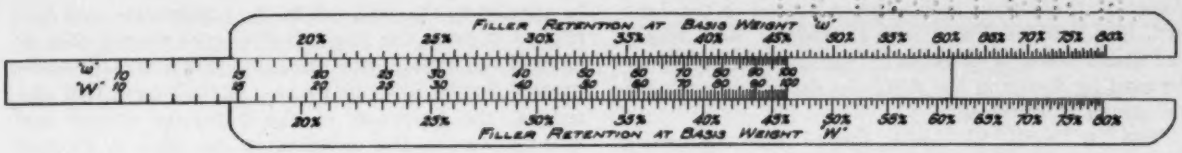


Filler Retention Slide Rule

O. K. GRAEF

IT is often necessary to predict the retention of filler in a new sheet, based on filler retentions experienced while running previous sheets. Perekalsky and Tomaschewa (Zellstoff und Papier, 14, No. 8, 319, 1934) have developed the formula

$$F = f\sqrt{\frac{W}{w}}$$

Where F = Percentage of filler retention at basis weight, W.
f = Percentage of filler retention at basis weight, w.
W = Basis weight of new sheet.
w = Basis weight of previous sheet.

For plotting on a slide rule, the first step is to put the equation in the form

$\text{Log } f - \frac{1}{2} \text{ Log } w - \frac{1}{2} \text{ Log } W - \text{Log } F = 0$

This is the general form for plotting, and it should be noted that the equation is so arranged that the signs alternate as far as possible and that the term usually solved for is placed last. Also this is the order in which the scales will appear on the rule.

For the purposes of this rule the limits were assumed to be:

"f" to vary from 20 per cent to 80 per cent,
"w" to vary from 10 to 100,
"W" to vary from 10 to 100,
and "F" to vary from 20 per cent to 80 per cent.

These limits should be varied by the individual constructor to suit the conditions under which the rule will be used. If the limits are smaller, then the scales will be shorter and a smaller rule blank may be used, or the scales may be plotted to a larger modulus, thus making them easier to plot and read.

To determine the best modulus to use, assume the length of a logarithmic cycle, or modulus, of 1 inch. Then by reference to a table of common logarithms, the "f" and "F" scales will be

1″ x Log 80 = 1″ x 1.9031 = 1.903″
1″ x Log 20 = 1″ x 1.3010 = 1.301″

Deducting, .602″ and this will be the length of the scale if the logarithmic cycle, or modulus, is taken at 1 inch in length.

Now for the "w" and "W" scales, a modification must be made because the formula indicates the extraction of a square root. When using logs, the method of extracting a square root is to divide the logarithm by 2. Following this out for the "w" and "W" scales will have the effect of shortening the scales by one half, thus

1″ x ½ Log 100 = 1″ x ½ x 2.0000 = 1.000″
1″ x ½ Log 10 = 1″ x ½ x 1.0000 = 0.500″

Deducting, .500″ and this will be the length of the scales to a modulus of 1″.

Note that the effect of the exponent is to reduce the apparent value of the modulus from 1″ to ½ ″. Actually the modulus remains at 1″ however, and the values of the logs are halved thus reducing the actual length of the scales by ½. In this type of slide rule, the modulus once established for any scale, remains at that same value for all of the other scales, although the length of the scales will vary according to the exponent of the term.

The length of the blank in the illustration was 14 inches with about 12 to 13 inches available for the scales proper. Then to establish the largest modulus which will fit on the scale, and yet not be so short as to be difficult to construct and read.

12″ (length of scale available) divided by 0.602″ (the length of the longest scale to a 1″ modulus) gives approximately 20, and this is the length of modulus selected.

To a 20″ modulus, the total length of the scales will be for the "f" and "F" scales, 20″ x 0.602″ = 12.04″ and the "w" and "W" scales 20″ x 0.500″ = 10.00″

To construct the key which will indicate the order and direction of increase of the scales, list the terms of the equation in a column as they appear in the formula, and as they will appear on the finished slide rule. Then, without regard to the actual sign of the term, place plus and minus signs alternately before and after each term. Then to determine the direction of increase of the scales place an arrow after the sign which corresponds to the actual sign of the term in the equation, pointing it away from the column.

Top section of rule stock	$-\text{Log } f + \rightarrow$
Top half of slide	$+\text{Log } w - \rightarrow$
Bottom half of slide	$-\text{Log } W + \rightarrow$
Botton section of rule stock	$+\text{Log } F - \rightarrow$

Therefore all terms will increase from left to right. This is always the preferable direction for the scales to increase when possible as alternating scales are somewhat more confusing to work with.

Plotting the "f" and "F" scales to the 20 inch modulus may be accomplished in several ways. The scales may be transferred directly from the C or D scales of a standard 20 inch slide rule by means of dividers. They may be plotted from a table of common logarithms, multiplying the tabular value by 20″ and plotting with an engineer's scale graduated to 50ths or 100ths inches. A variable logarithmic scale may be constructed, such as the one described in a

paper by the author, and which appeared in the January, 1937, issue of THE PAPER INDUSTRY. And, finally, the C and D scales of a standard 10 inch slide rule may be used by doubling the distances taken from the rule by means of dividers.

The "w" and "W" scales, due to their exponent of ½, may be plotted directly from the C and D scales of a 10" standard slide rule without doubling the length, or by one of the other methods previously described. It is important to remember that although these scales are plotted to an apparent modulus of 10 inches, the actual modulus is 20 inches as before noted.

After the scales are plotted and inked, they may be placed in position on the rule blank. In a rule of this type, where no index is used, it is necessary to solve a trial calculation first before gluing the scales in place. Then the scales on the upper section of the stock and on the slide may be glued in place. The scale on the lower part of the stock may then be glued in place in such a manner that the terms of the trial calculation are satisfied by the scale position. Rubber cement is not recommended for gluing scales in position for the reason that it does not retain its adhesive qualities for very long and the scales are likely to shift their positions. Mucilage and library pastes are too wet and tend to cause the paper to wrinkle. A good grade of glue is best, and when applying it a smooth even coat should be applied to the rule, not to the paper scale, and well rubbed in with the fingers. The glue should then be allowed to partially dry until it is tacky, and the scales pressed firmly down in place. By following this procedure, the tendency of the paper to stretch and wrinkle due to the moisture in the glue is avoided. After gluing the scales in place, the edges may be trimmed to conform exactly to the shape of the rule blank. A sharp razor blade is preferable for this purpose.

If the rule is to serve for a long period of time, it should be given several coats of white shellac which will preserve the scales from dirt and the effects of moisture.

The illustration shows the completed slide rule set to determine the filler retention of a 96 pound sheet on the basis of a 32 per cent retention of a 48 pound sheet.

"f" = 32 per cent
"w" = 48 lb.
"W" = 96 lb.
"F" = 45¼ per cent

Note in this connection that the units for the weight of the sheet are not designated. It is immaterial whether grams per meter, or pounds for any size ream, are used so long as both sheets are expressed in terms of the same dimensions.

Viscosity of Cuprammonium Solutions

FRANKLIN BARBER and JESSIE E. MINOR

DURING the past five years the test for the viscosity of cuprammonium solutions of rag stock, wood pulp and paper has won increasing interest along with other methods for improved technical control of the papermaking process. It has been widely accepted as the most reliable method by which the value of new stock offerings may be estimated, by which the degradation of fibrous stock during processing may be followed and reduced to a minimum, and by which the quality of the stock used in unknown commercial papers may be judged. By using the test as a measure of quality in mill control, it has been possible to make the same half stock from cheaper raw material and at the same time decrease the amount of degraded fiber and bleach residues with the accompanying complications.

The test consists in measuring the rate at which a one per cent solution of the fibrous material in cuprammonium solution will flow through a capillary glass tube. The time of flow varies from about two minutes or less for very poor stock to three to four hours for very hard rag stock. For stocks which drain within a half hour or less, results are usually quite consistent and duplicate results check easily. For the harder stocks of viscosities of 100 or more, which require more than a half hour to drain, it is more difficult to get check results and reliable figures require the averaging of three or more determinations. The data of this report was prepared in an effort to determine the reason for this difficulty with hard stocks and, if possible, to improve the technique so as to relieve it.

To show that the difficulty is in the concentration of the solution and not in some property of the harder stock, samples of the same hard stock were run at one-half per cent concentration and at one per cent with results which appear as in Table 1.

The table indicates that a difference of 5 per cent or less in the duplication of samples of hard stock run at one-half per cent is paralleled by a difference of 50 to 60 per cent when the same stock is run at one per cent concentration. Thus it is evidenced that the reason for the discrepancies with hard stocks should be sought in the

TABLE 1

Sample Number	Concentration of Solution	
	One Half Percent	One Percent
1	33.30	480.5
	33.56	406.0
2	27.86	302.9
	27.03	300.2
	28.42	192.9
3	36.14	242.8
	35.67	218.1
	35.47	216.3
		302.7
		351.0

extent or the conditions of the solution at the higher concentration. To this end a drop of the exuding solution of many tests was examined under the microscope and, while the one-half per cent solutions were usually clear and of uniform structure, the one per cent solutions quite commonly showed whole fibers or parts of fibers which were well swollen with the solvent but not yet entirely disintegrated as to gross structure. Such partially dissolved masses could easily form dense regions in the solution which would affect the average rate of flow through the capillary tube irregularly, dependent on their number and densities.

The possibility of affecting complete solution for the one per cent concentration by lengthening the time of mixing was next tried on a number of samples and results are indicated in Table 2.

Apparently the weaker concentration is about dissolved in five hours and for the denser solution eighteen

TABLE 2

Sample Number	Concentration	Time of Mixing	Viscosity of Solution
1	½ %	2 hours	37.75
		5 "	32.41
		18 "	33.04
	1 %	18 "	363.99
		21 "	331.07
		24 "	250.87
		27 "	330.08
		29 "	354.13
		42 "	386.94
		48 "	350.44
	½ %	5 "	33.16
		18 "	31.85
		24 "	30.41
	1 %	18 "	269.99
		24 "	376.99
		42 "	236.70

hours is sufficient to obtain an equilibrium which is not altered by longer stirring. The variations found with the longer stirring are so erratic as to merely confirm the inability of getting uniform solution conditions with these dense solutions, regardless of the time of stirring.

In the official TAPPI method it is stated that:

> "The cuprammonium viscosity is defined as the viscosity at 20 deg. C. of a solution containing one gram of bone dry pulp or its equivalent per 100 cc of solution.
>
> "The wide portion of the tube is etched with three rings at heights 24.2, 12.2 and 6.2 cm above the flat portion of the capillary. . . Etch mark B is optional to be used with hard unbleached pulps.
>
> "Fifteen hours in the dark in the absence of air are to be allowed for the complete dispersion of the pulp."

The concentration of one per cent was chosen on the basis of research reports from the Shirley Institute of England and was considered as a concentration which would give a reasonable distinction for the lower grade solutions and was possible of manipulation for the harder stocks. All work done with this test in the paper industry, so far as we know, has been on the basis of a one per cent solution and it would seem wise to maintain this basis for reporting.

TABLE 3

Laboratory Number	Viscosity ½ Percent	Determined at 1 Percent	Ratio
1	2.40	4.70	1.95
4	4.46	11.39	2.55
1	5.80	14.00	2.41
2	6.00	14.48	2.41
3	6.80	24.00	3.53
2	7.69	21.07	2.74
4	11.66	122.80	10.53
3	13.70	75.00	5.49
1	13.75	88.50	6.44
3	15.40	108.00	7.01
1	16.50	183.00	11.09
4	17.23	179.00	10.39
3	21.20	156.00	7.36
4	25.49	260.50	10.32
4	26.90	244.50	9.09
4	27.77	265.30	9.55
3	30.04	259.00	8.62
1	30.70	297.11	9.68
4	32.36	373.00	11.53
4	33.04	363.99	11.01
1	33.43	443.50	13.29
3	34.30	330.00	9.62
4	36.03	298.80	8.30
3	36.60	485.00	13.25
4	42.75	575.80	13.46
4	46.10	596.50	12.94
4	46.90	558.40	11.90
4	47.00	586.80	12.47
4	47.60	450.70	9.47
4	52.00	554.00	10.65

The TAPPI official method, as quoted, meets the problem of slow drainage of the one per cent solution of hard stock by calibrating the tubes to a two-thirds line in which only the more rapid, earlier part of the flow is measured. This change undoubtedly facilitates the convenience of testing for medium grade samples, but for the hard rag stocks, the remedy is wholly inadequate for accuracy. The objections may be listed as,

1—It does not eliminate the danger of clogging in the mixing tube with the resultant incomplete solution which may clog the flow through the capillary.

2—The very slow rate of flow of the hard stocks in

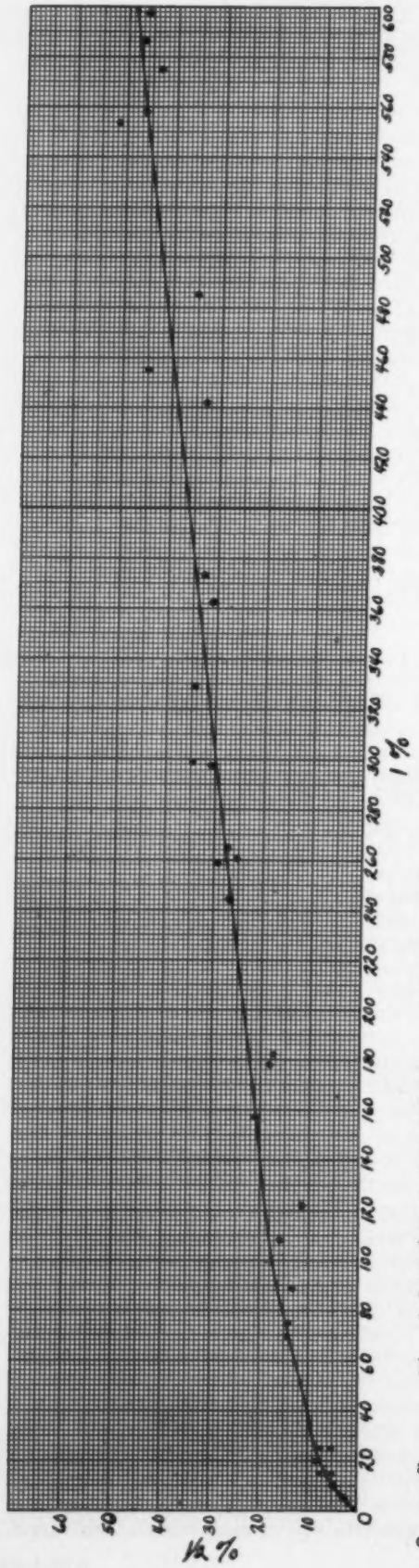
TABLE 4

Average of Values at ½ Percent for	Viscosity ½ Percent	Determined at 1 Percent	Ratio
Less than 10	5.53	14.94	2.70
10 to 20	14.70	126.05	8.57
20 to 30	25.34	231.58	9.14
30 to 40	33.06	356.28	10.78
40 to 52	47.06	553.70	11.77

solution makes the reading of the upper as well as lower meniscus line inaccurate and cumbersome.

3—While facilitating the work of testing, it does not insure checking of duplicates because it does not reach the basal cause of the discrepancy. The same factors which make inaccurate the flow of the solution to the lower meniscus function to a lesser degree when the two-thirds meniscus line is used.

It would be possible to use tubes with wider capillaries which would allow a more rapid drainage, but this would leave open the same inaccuracy as the two-thirds line and would require one to rightly guess the approximate value to be found when choosing the tube to use rather than when the rate of flow is under observation.



It has been in our minds for some time that it might be possible to run the test for the weaker stocks at one per cent as usual, then run the harder stocks at one-half per cent and calculate the results obtained at one-half per cent to a reporting value for one per cent. To do this it was first necessary to establish the relation by making parallel determinations at the two concentrations over the entire working range. In this work three near-by papermill laboratories contributed data and in Table 3 and the graph are given the results of work done in all four laboratories. In this way the results are shown to be independent of the particular technique or equipment of one worker. Part of the results were obtained on dry, ground samples, part on stock which was merely picked apart with a needle; part were obtained on equipment set up in the humidity room in which the temperature control is maintained during rotation, making it possible to run the test immediately on stopping rotation, others were made by rotating at normal room conditions, then immersing the tubes in a waterbath at 20 deg. C for one hour after mixing and before running the test. Three of the laboratories contributed data throughout the range, one only at the lower end of the curve. It was thus shown that the discrepancy in results at one per cent is independent of the technique of operation within the limits used. In every case where more than one determination was run with the same stock and the same concentration, the results were averaged, not chosen, and we believe that the points given in the graph fairly represent the relation existing between results at the two concentrations.

From the data of Table 3 it appears that the ratio of results at the two concentrations remains not far from the theoretic figure of two until the value for the one-half per cent exceeds 10 when it begins to rise rapidly and to fluctuate rather widely for the remainder of the range.

In Table 4 the results are averaged for each increment of 10 in the one-half per cent values. This brings out, as does the graph, the definite, regulated increase in the ratio value as the time of drainage increases.

It is apparent from Table 4 and from the graph that after the cuprammonium solution reaches a density indicated by the sharp increase in the ratio values, some type of aggregation sets in which very definitely slows down further solution. The well defined straight line of the graph suggests that it follows definite colloidal solution laws, but the poor agreement between duplicate tests in this region and the microscopical evidence of incomplete solution makes a relation formula uncertain.

It would be possible to use an experimentally determined curve as herein given, by which to translate the values for hard stocks to reporting figures. However, the ratio of the averages of all values given in the table of which the one-half per cent value is above 10, is 10.07 and, in running parallel tests at one-half and one per cent, in any part of the range from 100 to 600, it is quite common to get values which give a ratio of approximately 10. Therefore, it seems to us that it would facilitate the test and at the same time lead to more accuracy than is possible by the present method, if it were agreed that for all viscosity values above 10 for the one-half per cent or 100 for the one per cent, the test should be made at one-half per cent concentration and translated by a factor of ten to a one per cent value for reporting.

Such a method of procedure has advantages over the two-third line calibration in that,

1—It eliminates the work of double calibration.

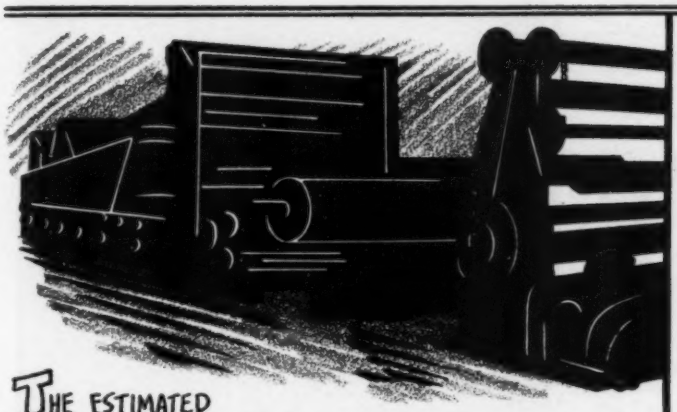
2—It is more sure of complete solution under present mixing system.

3—The rate of flow past the upper and lower meniscus is more accurately read.

4—Results may be duplicated with more accuracy.

5—It is more uniformly correct inasmuch as all measurements are on uniform solutions in similar state of aggregation.

Paper Sketches ---



THE ESTIMATED PAPER MACHINE CAPACITY OF THE UNITED STATES IN 1936 WAS 14,473,000 TONS - THE ESTIMATED PAPER PRODUCTION, 11,843,000 TONS.

HATS MADE OF WHITE PAPER, TRIMMED WITH BRIGHTLY COLORED FEATHERS, WERE "THE RAGE" AMONG FASHIONABLE ENGLISH WOMEN OF THE LATE 1700's.

MOISTURE-PROOF AND WIND-PROOF VESTS WERE WORN DURING THE WORLD WAR BY MANY U.S. SOLDIERS. THESE VESTS WERE COMPOSED OF 2 SHEETS OF CREPE PAPER, BOUND TOGETHER WITH A WATER-PROOF COMPOUND. JUTE OR COTTON YARN WAS INGENIOUSLY WOVEN BETWEEN THE SHEETS TO GIVE MAXIMUM STRENGTH AND RESISTANCE TO TEAR

A PRODUCT RESEMBLING EGYPTIAN PAPYRUS, BUT PREPARED FROM THE AMERICAN MAGUEY PLANT, WAS IN USE AMONG THE MEXICANS DURING EARLY TIMES.

Mulberry Tree As a Paper Material

RAFFAELE SANSONE

SEVERAL years ago, some large scale experiments were made in Italy to determine the possibilities of producing paper and paperboard from fresh twigs and small branches of the mulberry tree. The results of these experiments, made upon twigs and branches cut periodically from fairly well developed trees, were so satisfactory that future use of the processes evolved seems entirely possible.

Although the original experiments were conducted with the idea of finding a material to replace the jute in the making of bags to hold the chemicals required in manufacturing powder, a great many facts regarding the use of the mulberry fiber were discovered. Primarily, the fiber can be isolated and utilized in its different qualities without harming in any respect the leaves so important to the silk industry.

The Most Important Facts for the Paper Maker

The leaf from which the silk worm draws the material for making its cocoon is of little value to the papermaker. Of greatest importance is the outer or barky portion of the freshly cut twig in which is contained long and very strong filaments. These filaments, when properly isolated, yield a very fine raw material for papermaking.

The complete isolation of each fiber is unnecessary, however, unless the production of the very finest quality writing and tissue paper is desired. Such high grade paper possesses a certain degree of transparency and surprising strength despite its thinness. In the majority of cases, the freeing of the barky portion from a part of the incrustating substances will be sufficient to form an excellent material for producing good packing paper having more resistance than many cloth lined papers offered on the market today.

The internal woody matter, because of its short, weak and brittle fibers, is of relatively little importance in papermaking. On the other hand, it constitutes an excellent material for producing rayon and rayon acetyl cellulose, offering the advantage under favorable conditions of being easily converted into powdered form.

The belief, held in many quarters, that the mulberry tree constitutes a very inadequate means of augmenting the present sources of raw materials is erroneous. One must consider that the consumption of natural silk has increased despite the competition offered by the manufacturers of rayon. To cope with the demand, prize competitions for the planting of new mulberry trees have been instigated in many silk producing countries. This has brought about a fair extension of naturally grown trees in old areas and has created numerous new cultivations of great future importance.

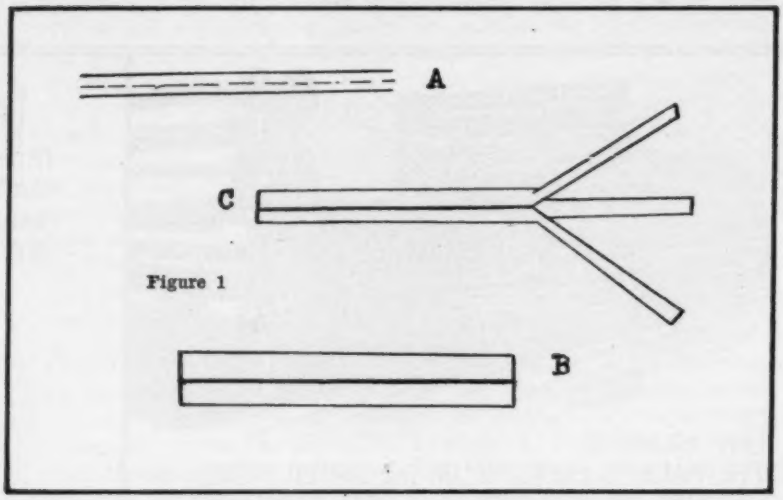


Figure 1

An increased demand for mulberry twigs in non-producing countries would undoubtedly cause grove owners to increase their production in anticipation of two markets, relieving them of dependence upon the silk industry as their only source of revenue.

Laboratory Experiments with Mulberry Bark

By pressing with iron weights freshly cut twigs from which the leaves had been removed, it was observed that the outer or barky portion contained long white filaments possessing very satisfactory strength and a certain luster. On combing and treating this portion with a carding device a very fair percentage of fibrous matter could be isolated and, through twisting, converted into threads of great strength and good appearance. Continuing the experiments, the isolation of the fiber through mechanical and chemical means was attempted and three distinct classes of materials were obtained. They consisted of a superior and shorter fiber resembling silk, a coarser and much longer fiber resembling linen and a very coarse fiber resembling hemp.

Working on a larger scale, a small pressing machine was secured containing two copper covered iron cylinders kept at a fixed pressure by means of screw wheels. By running a mulberry twig between the nip of the cylinders it was found that a single passage was sufficient not only to flatten it considerably but to force away a portion of the barky matter from the wooden center. In Figure 1, the untreated twig is indicated by *A*, the treated twig by *B*.

The separation indicated at *C* took place by repassing the pressed twig between the rollers. The woody center (*w*) was distinctly separated by the splitting of the bark portion into two separate sections indicated by *a* and *b*. Three or more twigs were then passed simultaneously through the same machine. By repeating this operation several times under the same conditions a small heap of bark was quickly obtained in which was delineated a lining of the nature shown at *T* in Figure 2. Much extraneous matter had, of course, been rubbed away from the more resistant portions.

By passing several of the bark strips through the rollers together, placed in such a manner that the harder portions reacted mechanically on the softer, a

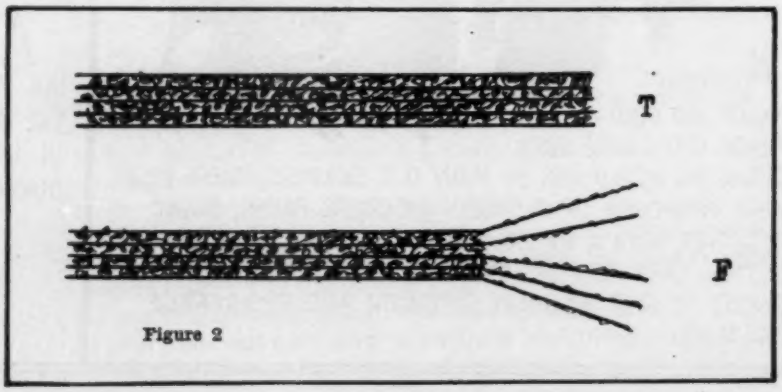


Figure 2

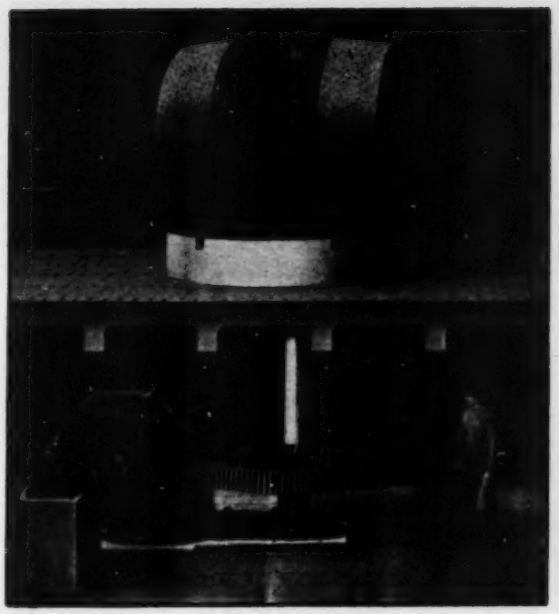


Figure 3

material in which the filament separation could be distinctly observed was brought out. Further pressing brought little additional change in form. Long, thick filaments could be conveniently separated with an iron comb; these filaments, used as they were or after further treatment, yielded a board of considerable strength. Results were especially good if a layer of some width, formed with parallel filaments, was crossed by a second layer of the same nature and the whole submitted to the pressure of the rollers. The rough, thick sheet thus formed was treated with a suitable bath of glue and pressed several times during the drying process.

By bringing the barky strips into the form of a band of two or more inches in width by one-half inch in thickness and passing it between rollers covered with a single layer of very thick cord or thin rope, a much greater proportion of the incrustation products could be powdered away and a material obtained in which the long fibers could be more easily isolated.

If the coarse, rough filaments of mulberry fiber which closely resemble those obtained from hemp and ramie plants, were boiled with carbonate of soda, much of the incrustation products remaining after the mechanical treatment could be extracted. If the material was again pressed between the rope covered rollers and beaten while drying, most of the non-fibrous portion could be converted into powder form and easily separated. A much better fiber, yielding a superior packing paper of great resistance and excellent appearance, will then result.

To produce a white fiber, the carbonate of soda treatment was followed by boiling with caustic soda and by further pressing and beating operations, the process being assisted by carding. The fibers of the material obtained in this way were longer and possessed greater strength than those of the best cotton.

Experimental Conclusions

Some of the facts obtained after further experimentation were of value in the large scale production activities later conducted. It was found that through pressing, the outer covering or green, barky matter of the twigs separated completely from the woody portion and could be stripped with one pull; that by submitting the barky matter to further pressing and allowing a sufficient amount of drying time between operations, the incrustation substances surrounding the fiber separated out leaving it comparatively free. Furthermore, by allowing the greyish, fibrous material separated through the pressing operations, to dry until containing a low percentage of water, it was possible to isolate long, fibrous filaments by combing with an ordinary hemp comb or hackle. These filaments contained a certain amount of covering and resembled, to some extent, those of hemp or china grass.

By boiling the filaments with a carbonate of soda solution followed by thorough rinsing and bleaching with hypochlorite of soda it was found possible to produce white papers of very satisfactory strength. If the raw bark was treated with a cold, caustic soda bath, allowing it to steep for some time before rinsing and drying thoroughly, the incrustation substances covering the mulberry fiber could be more easily removed and a much finer paper than the untreated material obtained. The quality was further improved by boiling in an alkaline bath and bleaching. It was also observed that although the woody portion was of a rather brittle nature it could be transformed into board and paper possessing a certain value.

Large Scale Investigation

To make the experiments on a sufficiently large scale to draw satisfactory conclusions, the pressing cylinders were replaced by a large, stone roller of the type used in repairing roads. Motive power to turn the stone cylinder was furnished by a horse. A thin layer of mulberry twigs was then placed in an oval ring on an asphalt floor and the cylinder rolled over them several times. The pressure and rubbing done in this manner was sufficient for detaching a portion of the bark.

During the pressing process several girls collected the twigs and rapidly separated the barky matter with small, iron forks or with their hands alone. This operation can be rapidly conducted if the operatives throw the separated bark in small heaps at convenient intervals. Ten girls were able, in this manner, to decorticate several hundred pounds of twigs within a ten hour working day.

In another experiment an ordinary steam roller was rolled repeatedly over gradually formed layers up to twenty-five yards in length arranged on a resistant stone surface. In this way large quantities could be treated within a comparatively short time and at considerably less cost than by the horse drawn method. The increased pressure of the steam roller caused not only a more efficient bark separation but also a noteworthy mechanical action on the vegetable products constituting a large proportion of the bark. An increased separation of powder resulted, shortening considerably the mechanical processes necessary to complete the product. The assistance of the girls was also required in this process, however, in separating the bark from the woody fiber after pressing.

Fiber Separation

The main problem in fiber separation was the reproduction on a large scale of the squeezing action of the rollers. This problem was solved, after some study, by using a mill of the type shown in Figure 3. Half dried mulberry bark was fed to the mill in a mixed condition and subjected to the pressure of two huge stone rolls, possessing also a slight up and down movement. This latter action subjected the material to small though continual blows and contributed

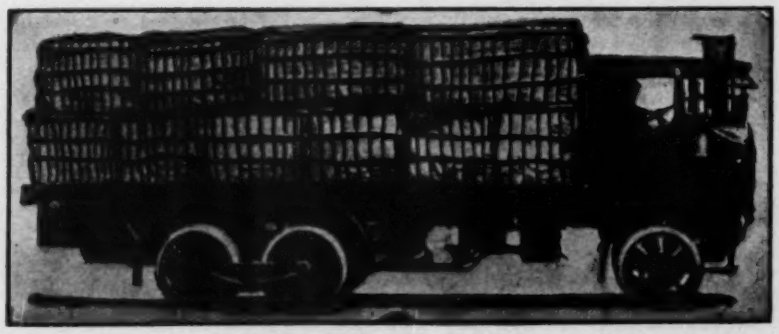


Figure 4

Figure 5—(left)

Figure 6—(right)

in a marked degree towards the breaking up of the incrustating products and reducing them into powder. Further treatment permitted easily cleaned fibrous matter to be collected and used in the production of strong packing paper.

A portion of the fiber obtained from the mill was opened out on small hand wool combers to produce a somewhat finer material. Quantities of the resulting product were then collected in large, improvised baskets and delivered to the paper mill in the truck shown in Figure 4, where various types of paper were produced from it.

A machine of the cotton industry was also tried. This machine consisted of a trough with a bottom formed by a horizontal lattice that moved upwards towards another lattice placed in a vertical position. The rods of this vertical lattice were tipped with strong iron points which continually ripped into the mass of fiber brought in contact with them. A certain quantity was pushed upwards along the spikes until removed by the teeth of a revolving cylinder placed there for the purpose. This cylinder provided an additional violent opening action. A stronger fiber but of shorter length was obtained by using this machine.

Obtaining Supplies of Mulberry Twigs

Because of the widespread area over which the twigs were produced, some difficulty was experienced in securing the necessary quantity. Cargoes of the type shown in Figure 5 were finally moved to the site of the experiment by means of ox carts.

The farmers soon learned, however, that the twigs could be sold and a greater amount was offered than could possibly be used in the experiments. It was also possible to send out a light cart pulled by a tractor and loads were secured in this way at an even lower cost.

Larger scale production would doubtlessly be more conveniently served by a system of trucks and trailers, now generally used in many other industries, to pick up the twigs and, as a further economy, the farmers could be taught to decorticate the twigs and supply only the bark itself to the buyers. Further expansion of the industry would, of course, lead to the transportation of the bark in shiploads from mulberry producing countries to sites more conveniently located for papermaking.

◆ Elihu Thomson

Professor Elihu Thomson, 83, famed American scientist and one of the founders of the General Electric Company, died at his home in Swampscott, Mass., March 13, following a serious illness contracted last January. Funeral services were conducted in Lynn, Mass.

A pioneer in the field of electrical science, Elihu Thomson, together with Thomas A. Edison, James J. Wood, and Charles F. Brush, was responsible for the creation of the modern electrical industry. Holding more than 700 patents in the United States alone, he pioneered as one of the early arc-light inventors, and experimented with the principle of alternating-current transmission far in advance of commercial demands. In fact, there was scarcely any aspect of electrical science in which Thomson had not been active at some time or another. His name was given to the Thomson-Houston Electric Company, organized in 1883, and merged in 1892 with the Edison General Electric Company to form the General Electric Company of today.

Professor Thomson was the only man who ever received all three of England's highest scientific honors—the Hughes, Lord Kelvin, and Faraday Medals. At one time he was vice president of the American Academy of Arts and Sciences and vice president of the American Philosophical Society, besides belonging to innumerable engineering societies.

Gardner-Richardson's New Laboratory

HARRY C. FISHER, Chief Chemist

THE main laboratory of The Gardner-Richardson Company at Lockland, Ohio, recently has been moved to new quarters. This laboratory conducts the general research and routine work for the Lockland plant. There are, however, small control stations at various places in the plant for such work as boiler water and coal testing, beater room control, inspection of finished board, etc. The Middletown plant of the company has separate laboratory facilities.

The removal of the Lockland laboratory was necessitated because of growth. First, the space formerly occupied by the laboratory was needed to take care of expansion of the mill stock room. Then the laboratory itself needed more space to accommodate a constant humidity testing room which would require 10x15 ft. in floor area.

The building where the laboratory is now located was formerly used for warehousing finished paper products. It is about 66x39 ft. with two floors and a basement, and is ideal for a laboratory. It is of brick and concrete with seven-foot windows on all sides insuring excellent light. The ceilings are high, providing splendid ventilation and the building is located near enough to the plant for convenience but far enough to afford the cleanliness, quiet and privacy conducive to the best scientific work.

The main laboratory room is located on the second floor. Here are the experimental beaters, jordan, sheet machines, hydraulic press, sheet dryer, etc., and the usual equipment of benches, tables and ovens, for pulp and paper testing. Built into this room is the constant temperature, constant humidity room, also a small study room, shower bath and lockers. Another room on the same floor contains complete equipment for making chemical analyses including balances, ovens, fume hood and a Fadeometer, the latter being used for color light fastness tests on both plain and printed paper.

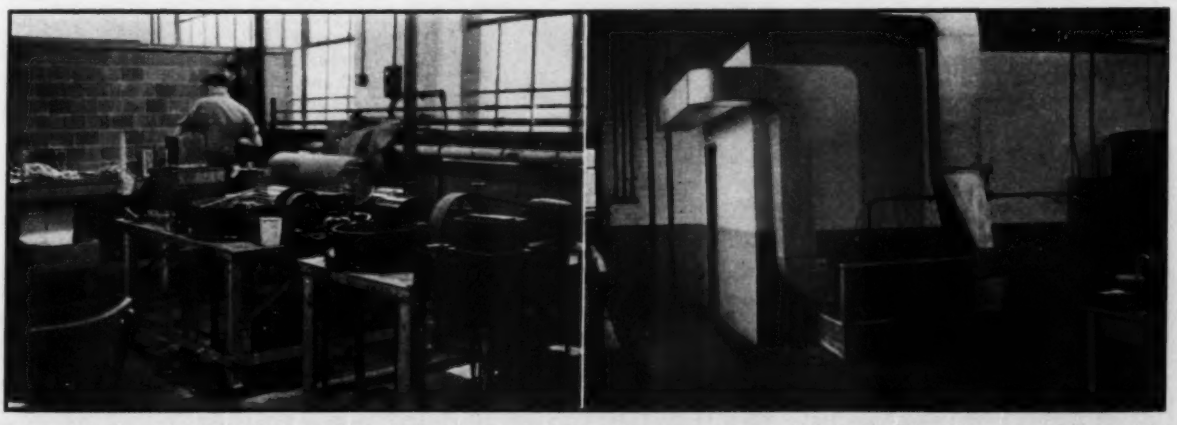
The equipment for pulp strength testing includes a Valley beater with adjustable bedplate, sheet mold 6x6 in., hydraulic press and drum dryer. For color matching there is a one-pound capacity Valley beater of older model with adjustable roll and another sheet machine. A larger beater of 1,500 grams capacity serves for miscellaneous purposes. There are the usual freeness testers for pulps in water.

The constant humidity room is designed for normal operation at around 70 deg. Fahr. and 50 to 65 per cent relative humidity, although much lower and higher temperatures and dryer or wetter conditions can be maintained. Instruments in this room include the Mullen, Elmendorf tear, Suvant stiffness, tensile, Gurley densometer and Bekk Smoothness testers, microscopes, Schoenberger Color Analyzer, sizing testers, gauge testers, etc.

The laboratory office is located on the first floor of the building. Here a library has been started. The remainder of the first floor is used as a store room and to house miscellaneous equipment such as a water heater and water still, the latter being placed within easy access of those in the plant requiring distilled water, e.g. electric "mules."

Left—The laboratory building. Right—The laboratory office

Part of the analytical room (left). Balances, ovens and fadeometer in the analytical room (right)



Shown at left are beaters, sheet machine, hydraulic press, dryers, etc., in one corner of the main laboratoy room, while at right is an exterior view of the constant temperature, constant humidity room

◆ Fourdrinier Wire Cleaning Brush

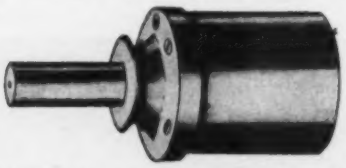
The Pittsburgh Plate Glass Company, Brush Division, Baltimore, Md., has developed a spiral wound cylindrical wire brush for the cleaning of a fourdrinier

wire while the wire is in operation. The brush requires no auxiliary power to operate it. It runs freely on ball bearings, and the travel of the fourdrinier wire turns it. The wire ends of the brush penetrate the mesh of the fourdrinier wire and force out any pulp and foreign matter retained by it. Each brush is built on specifications to accommodate any width and mesh of fourdrinier wire. The brush, which is refillable, is made of stainless steel wire.

The manufacturer states the brush has been in practical use for three years; that the brush is reducing shutdown losses, due to clogged wires, as much as 50 to 80 per cent; and that the brush will not mat or mush, brushes in service for twelve months being straight and as uniform in appearance as when they were installed.

◆ Fourdrinier Table Roll Bearing

The Fafnir Bearing Company, New Britain, Conn., has brought out a new ball bearing cartridge unit for table rolls of fourdrinier machines. This unit is said to be unique because of its compactness and because of simplification of the external roll support. Within the



housing of the unit is a grease chamber which retains the grease for an indefinite period and which does not permit entrance of water. Cadmium plate on the exposed portion of the shaft, a brass end-cap, and rust-proof fillistering-head fastening screws reduce corrosion or rusting.

◆ Large Thermo-Grip Electric Plier

Ideal Commutator Dresser Company, 1028 Park Avenue, Sycamore, Ill., has developed an electric plier for soldering lugs up to 1050 amperes or for sweating pipe fittings up to 2½ in. in diameter, when used continuously; or, for handling pipe fittings up to 4 in. in diameter, when used intermittently. The plier is designated as Ideal No. 10.

◆ New Line of Rotating Cam Switches

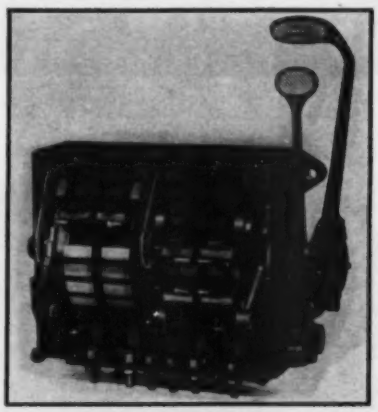
A new line of rotating cam switches, designated as CR3300, has been placed on the market by the General Electric Company, Schnectady, N. Y. These switches are furnished in two sizes—size O, rated 15 amperes continuous; and size 1, rated 25 amperes continuous. Both sizes are for 600 volts or less, alternating current.

Control applications for these switches include: single-speed motors for reversing application, two-speed, separate-winding motors for non-reversing application, or for one speed forward and one speed reverse; two-speed, single-winding motors for non-reversing application, or for one speed forward and one speed reverse; and three or four-speed motors for three or four speeds forward and one speed reverse. They also can be used as circuit-transfer switches.

◆ Industrial Truck Controller

Automatic Transportation Company, 101 West Eighty-Seventh St., Chicago, Ill., has developed a new industrial truck control for use on every new Automatic industrial truck, tractor and crane. The control, designated as Rotor-Brush Power Flow Control, was worked out to meet the demand for reliable voltage control, smooth power performance and long electro mechanical life.

The fundamental change in the design of this controller is the use of a motor type brush mounting which is rotary in action rather than stationary. Stator segments are of the commutator type and are unit moulded into a permanent insulated base with no loose segments



and no separate parts. The base is a stationary mounting and does not rotate.

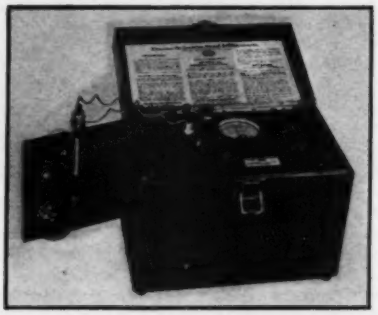
Another important feature is that the brushes are provided with constant spring tension which is self-compensating and requires no manual adjustment. These brushes also are constructed with exceptionally large contact areas which result in low voltage loss.

◆ pH-Redox Meter

The Coleman Electric Company, 306 Madison Street, Maywood, Ill., has announced the development of two new instruments, designating them collectively as Series 3 Coleman electrometers but individually as Model 3A and Model 3C. Model 3A reads directly in pH; while Model 3C reads both pH and millivolts, thus permitting the determination of redox as well as pH with the one instrument.

Both of these instruments are based on the same fundamental principles as the Coleman pH electrometer, but they are more compact, more sensitive, and simpler to operate.

The regular electrode assembly, the



manufacturer states, permits accurate determinations of either pH or redox to be made with less than 3 ml. of sample. Special micro assemblies also are offered, and means are provided for temperature and assymetry potentials compensation by calibrating against a known buffer. The electronic amplifier micro redox electrodes, adds the manufacturer, cannot polarize.

These instruments are offered complete with sealed electrodes, batteries, tubes and standardizing buffer, either by the manufacturer, or, in the middle west, by the Wilkens-Anderson Company, 111 N. Canal Street, Chicago, Ill.

◆ High Pressure Reducing Valve

The Atlas Valve Company, 282 South Street, Newark, N. J., has announced a high pressure reducing valve for working pressures up to 6,000 pounds without shock. This valve, designated as improved Type E, has a forged steel body and internal metal parts of stainless steel. It also is provided with a formed packing of special material.

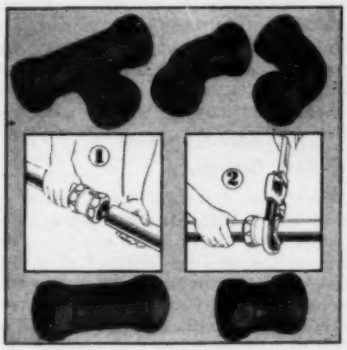
◆ Pipe Fittings for Threadless Pipe

S. R. Dresser Manufacturing Company, 684 Fisher Ave., Bradford, Pa., has announced a line of compression fittings for joining plain-end type. These fittings, designated as Style 65, include standard and extra long couplings, ells (both 45 deg. and 90 deg.), and tees, all supplied in standard steel pipe sizes from ½ in. I. D. to 2 in. I. D., inclusive black or galvanized.

The fitting assembly commonly includes a body with threaded ends to-

gether with an octagonal follower nut with armored gasket and retainer for each end.

To make a connection, the pipe ends to be joined are inserted into the fitting (which comes completely assembled), and the respective octagonal followers drawn up with a wrench. The tightening of the follower nuts compresses the gaskets around the pipes and completes the



joining. Threaded pipe can be joined in the same way.

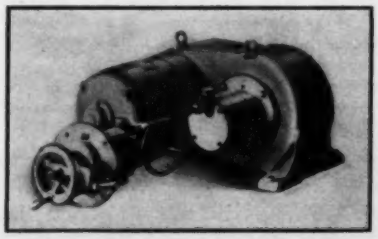
These fittings are recommended by the manufacturer for simplifying joint-making and repair work on both inside and outside piping for oil, gas, water, air or other industrial lines. The joints made by them are claimed to absorb pipe movements and stresses and to be permanently tight.

◆ Addition to Line of Speed Reducers

Foote Bros. Gear & Machine Corporation, 5301 South Western Blvd., Chicago, Ill., has added a new size to its line of Hygrade worm gear speed reducers. It is size 7HG and has a center distance of 7¼ in. with ratios of 3⅞ to 1 up to 2450 to 1. Horsepower ratings range from ⅛ to 27½ hp. in single reduction; and output torque ratings range from 12,600 to 21,000 inch pounds in double reduction types. Single reduction horizontal, single reduction vertical and double reduction types are available.

◆ Hydraulic Remote Control of Variable Speed Units

A new development of U. S. Electrical Motors, Inc., Los Angeles, Calif., is a



hydraulic remote control for its Varidrive motors. This development provides a smooth regulation of speed and an infinite number of speeds within the speed range of the individual drive.

◆ Self-Contained Low Pressure Refrigerating Units

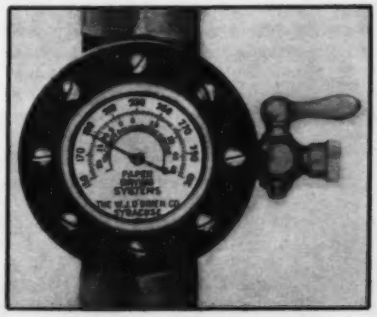
A new line of self-contained low pressure refrigerating units has been announced by Carbondale Division of Worthington Pump and Machinery Corporation, Harrison, N. J. These units are designed to employ either freon or methyl chloride as a refrigerant and are recommended by the manufacturer for both air conditioning service and general refrigerating purposes.

The compressor units, from four to eight cylinders and of the V-Type, mounted on welded steel bases, require small floor space and low head room. Both suction and discharge valves are of the lightweight, quick-acting Feather type. Units are motor driven through V-belt drives and have the usual automatic starting features.

◆ Paper Machine Dryer Thermometer

An indicating dial thermometer, designed for installation on any paper machine dryer without alteration of existing drainage system or control, has been announced by the W. J. O'Brien Company, 205 Harrison St., Syracuse, N. Y.

The dial is calibrated to show steam outlet temperature as well as relative



steam pressure and vacuum. A bi-metallic element actuates the pointer.

Built into the thermometer housing, as an integral part of the unit, is a lever handle pet-cock. This pet-cock permits testing for the presence of steam, air or water.

It is stated that the thermometer may be installed easily and quickly; that it does not in any way interfere with free passage of steam or condensate; and that it may be applied to a select few or to all of the dryers on a machine as desired.

◆ Mechanical Conduit Cleaner

Whiriflex Corporation, 607-615 Walbridge Building, Buffalo, N. Y., has announced the development of a device for cleaning the inside of pipe lines. The device, known as the Whiriflex, consists primarily of a power driven flexible shaft, brush, and pilot mechanism. The power driven flexible shaft revolves the brush and the pilot mechanism guides the device through the line being cleaned.

The cleaner is manufactured to clean lines from 3 in. to 14 in. in diameter and for use in any kind of pipe, such as copper, wood, or galvanized iron.

The manufacturer claims that the de-

vice will negotiate any turn, bend or elbow up to a 90 deg. bend; states that its efficient operating range is 80 feet; and guarantees it to remove all foreign matter from fresh water lines, stock lines, and white water return lines.

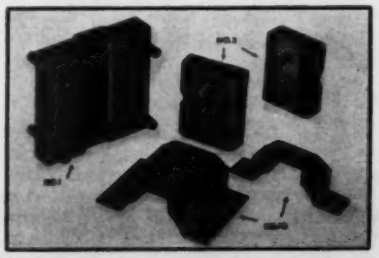
◆ Pneumatic System for Adjusting Roll Pressure

A new system for roll loading, known as the Foxboro Pneumatic Loading System, has been announced by The Foxboro Company, Foxboro, Mass. Smooth and instant adjustment of loading pressure on press rolls, calenders and supercalenders is claimed to be made with it by a simple turn of a knob. Provision also is made for unloading either end of a roll, or both ends simultaneously, by merely flipping a valve. In addition, a two-pen recorder records continuously the roll pressure at each end.

Other claims for this system include: roll pressure, once adjusted, remains constant; exact degree of loading is always known and can always be duplicated; and operation not affected by variations in air supply.

◆ Novel Machine Mountings

The B. F. Goodrich Company, Akron, Ohio, has placed upon the market a line of machine mountaings for absorbing shock and vibration, and for reducing noise. These mountings, known as Vibro-



Insulators, are made from bonded rubber to metal shapes formed in such a way that the rubber carries the load in shear. This design is said to have a sensitivity of movement eight times greater than if

the rubber carried the load in compression.

The line includes three standard types, designated as No. 1, 2 and 10, and larger designs capable of greater deflection and greater load capacity.

Only one rubber compound is used in the standard types. This compound has an exceptionally low permanent set and is stated to be adapted to practically all types of installations.

◆ THE BEAUTIFUL NEW building of the Mellon Institute, replacing the older one in use for 22 years, will be dedicated in the presence of eminent scientists from all parts of the world in ceremonies lasting from May 5 to May 9. Of classic design and modernly equipped to the last detail the structure will be dedicated in honor of Andrew W. and the late Richard B. Mellon who founded the Institute in 1913.

◆ THE FIRST SPRING meeting of the New York State section of TAPPI will take place on the evening of April 17 at the Hotel Syracuse in Syracuse, N. Y. Following dinner Curtis Haskins of F. C. Huyck & Sons will describe the design, manufacture and use of paper machine felts, illustrating his talk with a sound motion picture film which has recently been released. John Schuber, chairman of the section, will preside.

◆ Rex Vincent With Bulkley-Dunton

Rex Vincent has recently become associated with the Bulkley, Dunton Pulp Company, Inc., as a pulp technician. A member of TAPPI and well known in the middle west, Mr. Vincent has acted as chief chemist in several mills and up to a short time ago has been associated with the Container Corporation of America as assistant superintendent of their Coated Board division, Chicago.

As a pulp technician, Mr. Vincent will function for the benefit of pulp mill connections by conducting special studies to improve the understanding of conditions affecting customers' requirements and will advise on quality changes necessary to keep abreast of paper mill progress. He will also assist customers in the proper selection of grades to be supplied for a particular requirement commensurate with conditions and equipment.

Mr. Vincent will have headquarters at the Chicago office of the Bulkley, Dunton Pulp Company, Inc., 80 E. Jackson boulevard, under the direction of Roger Egan.

◆ Felix Pagenstecher

Felix Pagenstecher, one of the prominent figures of the paper industry, passed away at his New York apartment March 16. He was 56 years of age. Entering the paper business at the age of 16 with the Moser Paper Company in Chicago, Mr. Pagenstecher went to Kalamazoo with the Riverview Coated Paper Company in 1902 and became manager of the plant there a few months later. He held this position until 1919 when he resigned to become assistant to Frank H. Milham, president of the Bryant Paper Company. Upon Mr. Milham's death in 1921, he became president of the Bryant company holding office for 10 years. Since 1931, Mr. Pagenstecher served as president of the Hawley Paper and Pulp Company, Oregon City, Ore., and as vice-president of the Nekoosa-Edwards Paper Company of Port Edwards, Wis. He came to New York two years ago to serve as vice-president and sales manager of the International Paper Company and held that position at his death. He is survived by his widow, Mrs. Edith Pagenstecher, and a son, Robert.

◆ Blanchard Made Vice President of Magnus

The Magnus Chemical Company, Inc., of Garwood, N. J., has announced the appointment of David Blanchard as vice-president in charge of sales. For the past fourteen years Mr. Blanchard has been vice-president of the Portland, Maine, office, making an enviable record in that position and since 1930 leading the entire Magnus force in sales production.

An officer in the aviation section of the army during the war, Mr. Blanchard came to the Magnus Chemical Company at its inception in 1921 and has literally grown up in the industrial cleaning field. His new duties will place him in charge of the entire sales organization.

◆ AN INDUSTRIAL DEPARTMENT to act as a liaison between the company and industrials has been created by the B. F. Sturtevant Company. The department will work very closely with the engineering divisions to insure proper selection and correct design of the equipment manufactured by the company. J. C. Thompson will direct the activities of this department with headquarters in the executive offices of the company at Hyde Park, Boston, Mass.

◆ GENERAL REFRACTORIES COMPANY announces the appointment of the H. W. Porter Company of Newark, New Jersey, as distributor in the Newark area. A complete stock of refractories will be handled.

◆ THE IMMEDIATE CONSTRUCTION of a new $6,000,000 sulphite mill at Nipigon, Ontario, has been announced by Premier Mitchell Hepburn of Ontario. 6,400,000 acres of land, reclaimed by the Crown within the past few years, will furnish sufficient raw material for the mill under the terms of a lease executed by a Canadian company and the government. Further details of the plan, including the name of the company involved, will be released shortly by the Hon. Peter Heenan, minister of lands and forests.

◆ New Equipment at Fibreboard, Inc.

A rewinder that handles a board 114 inches wide at a speed of 1,000 feet per minute is included in the new equipment installed in the plant of Fiberboard, Inc., Vernon, Calif. Uniform tension has been assured by the elimination of friction on the drum while electricity used for breaking purposes will generate 60 per cent of the power required for rewinding.

Early this month, two 2,500-pound Dilts beaters and six Noble and Woods jordans will be installed. The new paper machine will be equipped with seven 42-inch cylinders with a 113-inch face and will have a Beloit suction drum press capable of removing 40 per cent more water than the present equipment. A Ross vapor absorption system is also being installed giving 120,000 cubic feet of hot air, about four times as much as the present capacity.

◆ Link-Belt Appoints New Directors

Four new directors were elected to serve until 1941 at the annual stockholders meeting of the Link-Belt Company at the Stevens Hotel, Chicago, on March 23. The newly elected directors, Bernard E. Sunny of Chicago and James S. Watson of Indianapolis, succeed Arthur L. Livermore, deceased, and Austin L. Adams, resigned. Directors Staunton B. Peck and Harris Whittemore, Jr., were re-elected.

Mr. Sunny is a director of several companies including General Electric Co., Illinois Bell Telephone, Public Service Co. of Northern Illinois, Wilson & Company, Chicago Surface Lines and the First National Bank of Chicago.

Mr. Watson is vice-president in charge of Indianapolis plant operations of Link-Belt Company, having served the company continuously for 44 years.

◆ New Method of Cellulose Determination

A new method of determining alpha, beta, and gamma cellulose in pulps and papers has been developed by Herbert F. Launer of the Paper Section of the National Bureau of Standards, it was announced recently.

The method may be used on pulps, rag stock, and papers. Alpha cellulose has been shown by investigators at the Bureau and elsewhere to be closely related to the stability of paper. Stable papers for record purposes are characterized by a high content of alpha cellulose, which is recognized as a criterion of stability. A correlation of the beta and gamma cellulose values with the physical properties or stability of papers has not yet been effected, hence the interest in these quantities is as yet more in the scientific field than in the field of practical application.

The unusual methods of determining the amounts of these cellulose components are essentially gravimetric. However, by this method of determination the cellulose components may be determined oxidimetrically with dichromate, in a completely volumetric method, that involves no precision weighings whatever, as contrasted with the 28 weighings for duplicate tests necessary in a gravimetric method. It is as precise as the gravimetric method, which is usually a standard of accuracy in paper

chemistry, and has the advantage of being far simpler and shorter.

Moisture and ash determinations, for example, are not necessary in this method, whereas they are indispensable in all others. The actual working time for four complete determinations is 1½ to 2½ hours, which is about ⅛ to ¼ of the time required by a gravimetric procedure. The gravimetric method requires samples weighing from 1 to 5 g, whereas this volumetric method employs a 0.3-g sample. Even a 0.03-g sample, corresponding to a piece of paper the size of an ordinary postage stamp, yields fair results. The advantages of a method capable of precision with such small samples are important, since often only small test specimens are available.

◆ Shaping Plans for Super's 1937 Meet

Programs for discussions, papers and entertainment are well under way for the 1937 convention of the American Pulp and Paper Mill Superintendents Association, Pennsylvania, New Jersey and Delaware division, April 30 to May 1, at the Ritz-Carlton Hotel, Atlantic City.

It has been reported that one of the major topics of discussion this year will be the modernization of equipment and plant expansion to meet the competition from the extensive Southern developments now taking place in the industry.

In addition to interesting papers and discussions on new products, newsprint and plant safety, there will be a banquet, group luncheons, ladies' programs, and entertainment features such as dancing, a bridge tournament and an outing on the Steel Pier.

◆ Southern Plant Under Direction of Perkins-Goodwin

Plans have been announced by the Southland Paper Mills, Incorporated, to erect a news print mill in east Texas. Steps to incorporate the new company for $5,000,000 to finance the erection of the mill are under way. Perkins-Goodwin, through President Louis Calder, will have active direction of the new plant, scheduled to go into operation in 1938, with a capacity of 150 tons. The mill will include a groundwood mill and a bleached Kraft mill to furnish the pulp supply.

Arthur Newcombe, a well known paper mill operator, will represent Perkins-Goodwin in active management of the mill, the output of which will be sold to Texas publishers.

◆ New Flame-Proofing Agent

A new flame-proofing agent for paper and textiles just developed was demonstrated March 31 at the du Pont exhibition under the auspices of the Museum of Science and Industry in New York City. Paper and textiles treated with this new chemical are highly flame-proof and have, at the same time, a soft, pleasing "feel." The chemical has no appreciable effect on the strength of materials or on the dyestuffs commonly used. While not fire-proof, in the sense that they cannot be burned, materials are flame-proof in that they do not blaze or smolder and thus cannot spread a fire.

A wide variety of du Pont products will demonstrate, during the course of the exhibition, the effect the chemical manufacturing industry has had on various other lines of manufacture.

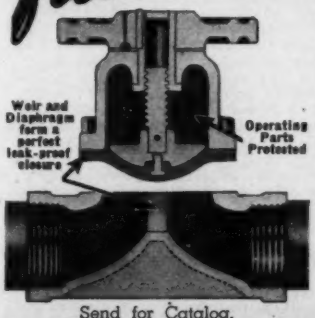
◆ THE UNITED STATES department of commerce at Washington reports a 21 per cent increase for paper imports from Canada during 1936, over 1935. A $16,000,000 gain in pulpwood, wood pulp, rags, and all other paper base stocks, was reported by the department, in the Canadian import statement.

◆ Albemarle Acquires Halifax Paper Co.

Announcement has just been made that the Albemarle Paper Manufacturing Company, Richmond, Va., has purchased the plant of the Halifax Paper Company at Roanoke Rapids, N. C.

The Halifax Paper Company plant is one of the oldest plants in the South. The Albemarle Paper Company recently participated in the organization of the Chesapeake-Camp Corporation, which is now building a plant at Franklin, Va.

No Fibre or Suspended Matter can stop this Valve from shutting tight



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—used extensively in Paper Mills for handling stock, alum solutions, hypochlorite solutions, chlorine water, liquors, caustic soda solutions, compressed air, water, etc.

The Valves do not leak, stick, break, corrode or wire-draw and are free from operating difficulties generally experienced with ordinary valves.

Available in ½" to 12" sizes—with bronze, stainless steel or cast iron bodies lined with glass—rubber or lead.

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VALVES

To be recognized as a leader is a compliment to ability. It may be the gray goose who leads his flock southward—the thoroughbred that wins the derby—or an organization that stands foremost in its field. In well drilling and pump engineering, Layne has long been the leader:—a world-wide organization with every modern facility, and a proven record of success in doing the job with speed, efficiency and satisfaction.

Paper Plant executives may obtain interesting literature by writing Layne and Bowler, Inc., Dept. P. Memphis, Tennessee.

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LAYNE PUMPS
LAYNE WELL WATER SYSTEMS

◆ New Catalogues and Publications

Bausch & Lomb Optical Company, Rochester, N. Y.—A well illustrated new bulletin has just been issued describing seven types of research microscopes built by the company. A photomicrographic microscope is featured and necessary accessories for all instruments are discussed and pictured.

L. L. Brown Paper Company, Adams, Mass.—A colorful little booklet defining and describing rag content papers and containing a specification guide to the correct use of these papers for business purposes has just been published. Copies may be obtained on request to the company.

Combustion Engineering Company, Inc., New York—Has released two new bulletins. One contains the specifications and engineering data on the new CE-Skelly Stoker for small commercial and industrial installations; the other covers an extensive line of CE bent tube boilers and contains many photographs of furnace and boiler details. Both bulletins are printed in two colors and attractively illustrated.

Consolidated Air Conditioning Corporation, New York—A new pamphlet describing the reduction of the amount of fresh "make up" air obtained by the use of a new "Odor Absorber" and covering the costs involved in the operation of an air conditioning system has been published and will be mailed on request to the company.

Edgemoor Iron Works, Incorporated, New York—Products bulletin No. 103 lists double motion agitated mixers, stationary or tumbling digesters, rotary hot air or steam tube dryers and other items constructed in all metals for paper manufacturers. Machinery for chemical, dye, sugar, rubber and rayon plants is also described.

Electric Controller & Mfg. Company, Cleveland, Ohio — This company has brought out a well printed, illustrated booklet describing typical installations of their centralized motor control units which can be used in close proximity to the motors they control, thus eliminating the control room and cutting wiring costs.

Fairbanks, Morse & Company, Chicago, Ill.—Bulletin No. 6165, describing new self-oiling pumps for handling mud, slush, clear water, petroleum products and other liquids at a capacity 23 to 94 gallons per minute; and bulletin No. 1600, describing a line of polyphase woundrotor or slip ring, ball bearing induction motors, have just been issued by this company.

Graham Transmissions, Springfield, Vt. —A folder describing the types of variable speed transmissions built by this company is available. The dimensions, speeds and capacities, methods of selection and control of the transmissions are discussed and tabulated while the prices are listed for standard models.

International Nickel Company, Inc., New York—A publication by the research division of this company entitled "Some Consequences of Graphitic Corrosion of Cast Iron" may be obtained by addressing the publicity department. The bulletin deals with the mechanism of a type of corrosion of cast iron that results in the formation of a surface layer of residual graphite and is informative and authoritative.

Leeds & Northrup Company, Philadelphia, Pa.—A much simplified cell assembly which conditions a flue-gas sample by saturating rather than by drying is a development in CO_2 Recording Equipment announced in catalogue N-91-163. Another catalogue, EN-96, describes an apparatus for hydrogen-ion concentration measurements in plant and laboratory.

James F. Lincoln Arc Welding Foundation, Cleveland, Ohio—The $200,000 prize contest, announced in the March edition of THE PAPER INDUSTRY, is thoroughly described in a handsome 50 page brochure issued by the foundation. A large chart of the various prize awards and a detailed explanation of the classification of subjects will be of help to the contestant. Requests for information should be addressed to the secretary of the foundation.

Metallizing Company of America, Inc., Los Angeles, Cal.—This company has prepared a 36 page booklet in which is contained a complete photographic story of the metal spraying process. Copies on request.

McCollum Hoist & Mfg. Company, Downers Grove, Ill.—Information, prices and weights of the Universal Hand Chain Hoist and the Universal Electric Hoist are fully given in two new leaflets just released by this company.

Mine Safety Appliances Company, Pittsburgh, Pa.—A bulletin illustrating and describing an instrument for continuously sampling atmospheres where combustible gases and vapors may be present and which provides an electrical warning when the concentration of flammable gases exceeds a predetermined limit has just been published.

National Aniline & Chemical Company, Inc., New York—A series of articles reprinted from "Dyestuffs" is the subject of a 55 page booklet issued by this organization. Titled "Study on Paper Coloring" it includes material on dyes for coloring paper; making beater-dyed paper fast to light; minimizing off shade production losses; decreasing two sidedness of a paper; coloring of container board and dipping and calendar staining of paper. Available on request.

Patterson Foundry & Machine Company, East Liverpool, Ohio—A new dissolver for cutting cotton, dissolving cellulose acetate and natural and synthetic resins and three types of process kettles are illustrated and described in a leaflet recently issued.

Pennsylvania Salt Manufacturing Company, Philadelphia, Pa.—A booklet on Penchlor Acid Proof Cement has just been announced by this company. It contains information and practice in the construction of acidproof masonry in various installations, technical data and various industrial applications of Penchlor. Address requests to the executive offices of the company.

Pittsburgh Piping & Equipment Company, Pittsburgh, Pa.—The first issue of "The Stainless Fabricator," a bi-monthly bulletin with information of interest to alloy steel users and news of the Alloy Division of the company, was recently issued.

Precision Scientific Company, Chicago, Ill.—An 8-page, two-color bulletin pictures and concisely describes all Freas and Theico models of incubators, sterilizers and humidity cabinets. Their respective applications and individual characteristics with the salient features of construction are pointed out. Twenty-eight models are illustrated.

Reliance Electric & Engineering Company, Cleveland, Ohio—In bulletin 501, illustrations and explanations of six Reliance Motor-Generator sets are briefly given. Separate bulletins give a more detailed description of the various units described in this leaflet.

S. Morgan Smith Company, York, Pa.—Statistical material on determining the power available at a water power site is included in one of several booklets published by this organization. Various types of pumps are sketched and described and the manufacturing methods in use are discussed and photographed. Pictures of several manufacturing companies using Smith equipment are appended.

Stephens-Adamson Manufacturing Company, Aurora, Ill.—"The Labor Saver," house organ of the S-A company, contains a very attractive 2 page center spread depicting the conversion of an historic old Georgian plantation on the Savannah river into the modern sulphate pulp and paper plant of the Union Bag and Paper Corporation. D. W. Griffith filmed scenes from his famous "Birth of a Nation" on this site while Henry Ford has moved the old plantation buildings to another location to make way for the 135 ton daily capacity plant.

C. J. Tagliabue Manufacturing Company, Brooklyn, N. Y.—A new catalogue, No. 900C, completely describes and illustrates the latest models of TAG non-indicating controllers for temperature, pressure and time. In addition to the instrument listings, a comprehensive discussion of the various types of controllers, their applications and how they work is contained.

Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa.—A bulletin describing the Westinghouse Trans-O-Meter, a simple, portable, direct reading electronic device for measuring the transmittancy of flat materials is available on application to department 5-N of this company.

Worthington Pump and Machinery Corporation, Harrison, N. J.—A very informative bulletin containing a flow chart covering the manufacture of paper, a conversion table, cross section diagrams of centrifugal paper stock pumps with complete general specifications and other items of interest has been issued by this manufacturer.

BOOKS

The Manufacture of Pulp and Paper (Volume III) — This volume, just published in its third edition, covers the preparation and treatment of wood pulp. The new edition brings the work of the two earlier editions up-to-date. It includes completely revised material on soda pulp, sulphate pulp, bleaching of pulp, and testing of pulp as well as new material on the stacking of wood, the pressing and drying of bark, the grinding of wood, the screening of pulp, the recovery of heat and acid in sulphite cooking, the use of acid resistant steel, furnaces for heat recovery in alkaline pulping, bleaching, and the testing of pulp. Information on the properties of pulpwoods also has been extensively revised. The entire revision was effected by the Joint Textbook Committee of which J. N. Stephenson is editor through the assistance of approximately fifty specialists. It is a work of more than 800 pages. The publisher is the McGraw-Hill Book Co., Inc., 330 West 42d Street, New York; and the price is $6.50 per copy.

Mechanical Power Transmission Handbook — The author, William Staniar, a well-known writer on power transmission subjects, states in the preface to this volume that his object in preparing it has been to furnish definite and concise information on the selection and application of mechanical power transmission equipment. It is a work of nearly 500 pages, well interspersed with helpful tables and illustrations. Mr. Staniar discusses in some detail, and yet not in too technical a manner, such subjects as power belting; fastening of power belting; power transmission by belting; flat belt pulleys; steel shafting; bearings; clutches, couplings, collars; short-center driving methods; chain driving; mechanical transmission systems; high-starting-torque devices; infinitely variable speed control; gear-reduction units; lubrication of mechanical power equipment; and motors and miscellaneous data. The book should prove a valuable handbook to pulp and paper mill engineers, maintenance engineers, master mechanics, design engineers, mill superintendents and others who may in any way be connected with the numerous power transmission problems of the industry. It is priced at $5.00 per copy by the publisher, the McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y.

Money and Pulp

ROGER J. EGAN
Bulkley, Dunton Pulp Co., Inc.

AT THE present juncture in the operation of the law of supply and demand (a law Congress forgot to repeal), I do not believe that I can make any accurate forecast either on exact price levels or the time that certain factors will begin to operate. However, I believe that there is a fundamental situation in the making that will have a very definite effect and will be recognized after the event, as a major factor. This factor is money.

In July of 1934, an article written by me appeared in the *Paper Trade Journal* entitled "Money and Pulp." I would like to quote the concluding statement in that article:

> "The relation between pulp prices and currency changes is quite evident. Of course, factors other than currency can and will affect any prices, but a radical change in the administration's money policies will probably exert a major influence on pulp prices."

There have been other factors that have affected pulp prices and the ever changing balance between supply and demand will continue to affect pulp prices. The changes in supply and demand for chemical fibre can be analyzed and forecast with reasonable accuracy as to trend, but the forecasting of the changes due to currency can only be done in Washington.

I believe, therefore, that it is very important, in studying the development of pulp prices, to watch the Washington situation.

We all know that pulp prices have reached very attractive levels from the point of view of the pulp manufacturer, and I am told that the easiest job in the paper industry today is pulp selling. I, personally, feel that the present situation is just as hard as 1933 and 1934; perhaps, in a different way but I feel that my primary obligation as a salesman today is to help figure out, not the cause of what has happened, but to forecast what is going to happen.

The inflationary effect of the United States money program has been a large factor in present pulp price levels. It can be just as important a factor in a decline if the Administration decides that the time has arrived to deflate. An overnight deflation in the value of gold in terms of United States dollars can deflate the pulp price levels in the United States without relation to immediate world price levels.

In studying a world commodity such as pulp, any fundamental trend in the supply and demand ratio takes time to operate even though the actual price level may rise or fall due to some psychological situation affecting the minds of buyers and sellers. If the statistical and technical factors in the world pulp markets have created a condition which is about to, or has already started to, reverse a trend (regardless of whether this trend is up or down), any occurrence which can have a psychological effect on buyers and sellers may cause a rapid change in price levels even though the fundamental factors are moving slowly.

I view money changes as one of the factors that can have a profound psychological effect.

In conclusion, I would like to repeat the statement above quoted:

> "Factors other than currency can and will affect any prices, but a radical change in the administration's money policies will probably exert a major influence on pulp prices."

◆ Customs Court Rules on Newsprint

That standard newsprint is such paper as was known as such and chiefly used by newspapers when the Tariff Act of 1930 was passed, was the decision of the United States Court of Customs and Patent Appeals rendered Monday, March 29, in the most important paper case before the Customs Courts in many years. The case involved paper imported from Canada for the publishing of a rotogravure weekly supplement for the Christian Science Monitor of Boston and the court held the paper to be dutiable, not duty-free standard newsprint as claimed by the importer.

The decision is the most clear cut ruling on the character

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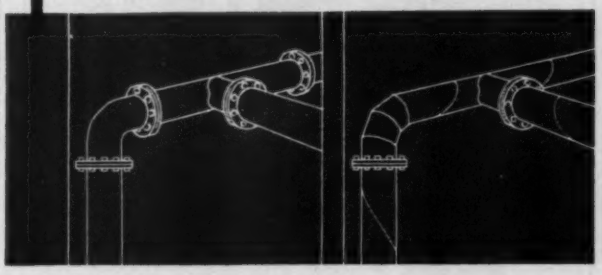
TO CUT PIPING COSTS

• One way to save money on piping is to cut out unnecessary joints. Another way is to eliminate excess metal; and the third way is to select a pipe that is economical to install and maintain. Now let's consider Armco Spiral Welded Pipe.

YOU SAVE on joints because with Armco pipe, standard or special fittings can be fabricated as integral parts of straight pipe runs. Note the comparison below.

1



YOU SAVE on metal because you can specify the one right diameter, wall thickness and coating for each service requirement. Diameters range from 6 to 36 inches; wall thicknesses from 7/64 to ½-inch.

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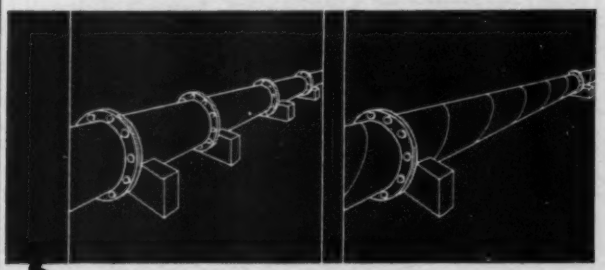

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YOU SAVE on installation and maintenance because Armco pipe is the easiest handling pipe ever made for the paper industry. It is amply strong . . . simple to support or suspend in long or short lengths . . . and its smooth interior assures high flow capacity.

• Reap these important savings on your next pipe job by mailing your inquiry or specifications directly to The American Rolling Mill Co., Pipe Sales Division, 706 Curtis Street, Middletown, Ohio.

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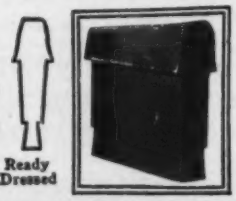

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PAPER MILL MACHINERY

FOR SALE—Paper mill site, cheap, for immediate disposal. Concrete and brick buildings. Stock chests; water filter; 5 beaters; 10 water wheels, 3 in operation. 900 hp. available. Ideal for tissue mill. Located on Hudson River. Address Box 255, THE PAPER INDUSTRY.

WANTED—Small size used corrugating machine for making double face corrugated board. Give size, make, condition, price and where located. Address Box 257, THE PAPER INDUSTRY.

A NATIONALLY known manufacturer of wax emulsions wants to contact salesmen or sales organizations who now have established business connections with the paper industry and who are interested in selling on a commission basis new, but thoroughly proven coating materials to this industry. Address Wilbur White Division, Franklin Research Company, Philadelphia, Pa.

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of standard newsprint yet to be handed down by the Customs Courts. The appellate court held that the paper was dutiable, that it was not standard newsprint, and in declaring that standard newsprint and newsprint are different papers held that the paper in question was not even newsprint.

The case was initiated by the Import Committee of the American Paper Industry about two years ago, when the Customs officials were convinced that the paper was not standard newsprint, and collected duty at the rate for printing paper. The importers protested to the United States Customs Court, represented by Elisha Hanson, Counsel for the American Newspaper Publishers' Association. The United States Customs Court held the paper to be duty free as standard newsprint, even though it was shown to have a basis weight of over 36 pounds, far above the usual weight of paper used for newspaper publication.

◆ Steam Department of Bagley & Sewall Transferred to W. J. O'Brien Co.

The Bagley & Sewall Company of Watertown has completed arrangements for transfer of the steam department, formerly the Farnsworth Company, to the W. J. O'Brien Company of Syracuse where it will be operated independently by the Syracuse organization.

George Onfrey of Watertown, formerly secretary of the Farnsworth Company and later of the Bagley & Sewall steam department will become affiliated with the W. J. O'Brien Company.

Office equipment and records have already been moved to Syracuse. Manufactured parts and heavy pieces of equipment will be held in Watertown for shipment as these are sold out, according to W. J. O'Brien, president of the Syracuse organization.

Until the death of F. C. Farnsworth in 1933, the Farnsworth Company was one of the leading manufacturers of paper mill drainage and steam equipment and now has installations in all parts of the world. Taken over by The Bagley & Sewall Company after the death of Mr. Farnsworth, it had been operated as the steam department of the Watertown company and supplemented the paper mill equipment manufactured there. The transfer of this unit to the W. J. O'Brien Company of Syracuse will not affect the present operations of the Bagley & Sewall Company, it is understood.

W. J. O'Brien, president of the Syracuse organization, has announced that they will continue the manufacture of the Farnsworth equipment for replacements and repairs, and that a completely new line of paper drainage equipment will be manufactured in Syracuse where the company has the facilities of one of the most modern machine shops, brass and iron foundries in Upper New York State.

As head of the W. J. O'Brien Company, Mr. O'Brien continues the active participation in the manufacture and sale of paper mill equipment which he started as proprietor of the O'Brien Steam Specialty Company in 1920. He is a member of TAPPI, the National Association of Power Engineers, Syracuse Chamber of Commerce and Kiwanis.

Associated with Mr. O'Brien in the W. J. O'Brien Company, besides Mr. Onfrey, is Philip Silverman, graduate of the New York State College of Forestry and specialist in paper and wood pulp manufacture. C. A. Woodruff of Rochester, N. Y., consulting engineer for Lawless Paper Co., Foster Paper Co., Garlock Packing Company and other Central New York mills, has been retained by the W. J. O'Brien Company for consulting service in the new organization.

◆ Plans Maturing for Paper Superintendents' Convention

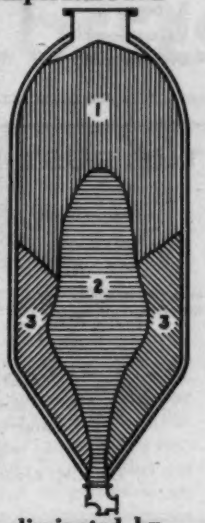
Word comes from general headquarters of the 1937 Paper Mill Superintendents' Association Convention that all committees are speeding arrangements along in high gear under the able leadership of W. Gordon Booth, general chairman of the convention.

A tentative schedule of the program, including principal events, speakers, entertainment features, etc., will be available about the first week in May. Ambitious plans will be carried through to contribute to the profit and pleasure of every guest attending. Convention facilities will be ideal this

MAKE BETTER PULP
***at* LOWER COST**

by employing forced circulation in the digester

NATURAL digester circulation from convection currents and gas ebullition cannot develop uniform temperature and pulp quality throughout. Zone 2 (see diagram) along the central axis becomes the hottest and Zone 3 along the lower cylindrical and the conical portions of the shell stays the coldest. Proper cooking in Zone 1 produces severe overcooking in Zone 2 and undercooking in Zone 3; and variation of the zones in different cooks further impairs overall pulp quality. Only during the last two hours of the cook, after steam is shut off and pressure reduced, is any semblance of temperature uniformity attained.



These faults are entirely eliminated by our system of liquor circulation, which preheats the liquor externally, forces it through the digester, automatically unifies digester temperature and pressure at every point, and standardizes successive cooking cycles. The resulting better quality and larger quantity of pulp per cook are obtained in shorter time and with a precision that the ordinary production method cannot approach. Less steam and chemicals are required and in addition the condensate with its valuable heat is returned to the boilers.

All this is accomplished with simple equipment, including principally a strainer, a pump, an indirect heater and necessary connecting pipe, with automatic control equipment if desired.

The low operating cost of the system and ability of all parts to resist corrosion are proven in successful installations which are available for inspection.

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MECHANICAL POWER TRANSMISSION HANDBOOK

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The recommendations given in this book for the selection, use and installation of transmission appurtenances are based on the author's twenty years' experience in this field of engineering. The book tells the superintendent, plant engineer, designer, millwright and mechanic exactly what they want to know when confronted with everyday problems of transmitting power mechanically. It covers latest developments in this field—including all methods—and explains how, when and where to use them so that economy of operation and efficient transmission result.

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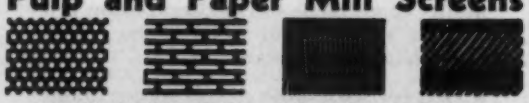

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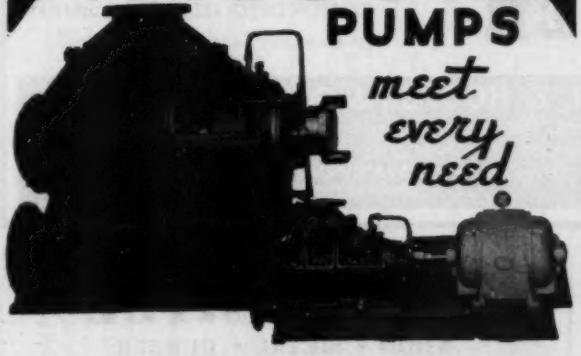
year. All of the sessions will be held in the same building as the Paper Progress Exhibit to be put on by suppliers of the Industry. This is the Industrial Arts Building of the Eastern States Exposition Group at Springfield, Mass. Adequate hotel accommodations will be provided by five or six of Springfield's first class hotels. A splendid program of entertainment is being planned for ladies of the convention.

Leonard P. Taylor, chairman of exhibits, reports that a large amount of booth space has already been sold at the Paper Progress Exhibit. Five days after the space was opened for sale, the following had definitely indicated their desire to exhibit, most of them having been assigned definite spaces:

The Foxboro Company—Foxboro, Mass.
A. E. Broughton & Company—Glens Falls, N. Y.
The Sinclair Company—Holyoke, Mass.
Warren Steam Pump Co., Inc.—Warren, Mass.
The American Brass Company—Waterbury, Conn.
Hercules Powder Co., Inc.—Kalamazoo, Mich.
E. D. Jones & Sons Co.—Pittsfield, Mass.
Cheney-Bigelow Wire Works—Springfield, Mass.
Brown Instrument Company—Philadelphia, Pa.
Bird Machine Company—Walpole, Mass.
Oliver United Filters, Inc.—New York, N. Y.
International Nickel Co.—New York, N. Y.
The Sandy Hill Iron & Brass Works—Hudson Falls, N. Y.
Paper & Industrial Appliances, Inc.—New York, N. Y.
Paper Makers Importing Co., Inc.—Easton, Pa.
Chapman Valve Mfg. Company—Holyoke, Mass.
Penick & Ford Ltd., Inc.—Cedar Rapids, Iowa.

It is apparent that this year's Paper Progress Exhibit will offer the largest and finest educational display ever put on by suppliers in the Paper Industry. It is a remarkable testimony to the interest shown in the Paper Progress Exhibit this year that space taken by the above listed suppliers amounts to approximately 37% of all space used at last year's Grand Rapids Exhibit and this within a period of five days.

"R-C" VACUUM PUMPS meet every need



No paper mill vacuum requirement too large or too small for Roots-Connersville new type, roller bearing, Herringbone Gear Vacuum Pumps.

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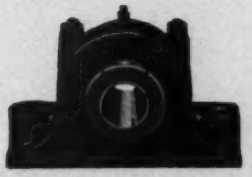
INCREASE PRODUCTION EFFICIENCY
DECREASE POWER LOSSES



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Don't pay numerous "friction penalties" that you can easily avoid by placing Medart Timken Pillow Blocks, Hanger Bearings, Flange Units and Unit Mounts in your production line... This not only reduces the needless cost of power losses but adds efficiency because friction and wear are minimized.

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July 1, 1936 to June 30, 1937
Cum. Scores as of February 28
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PERFECT SCORE
Division I—Paper and Pulp Mills

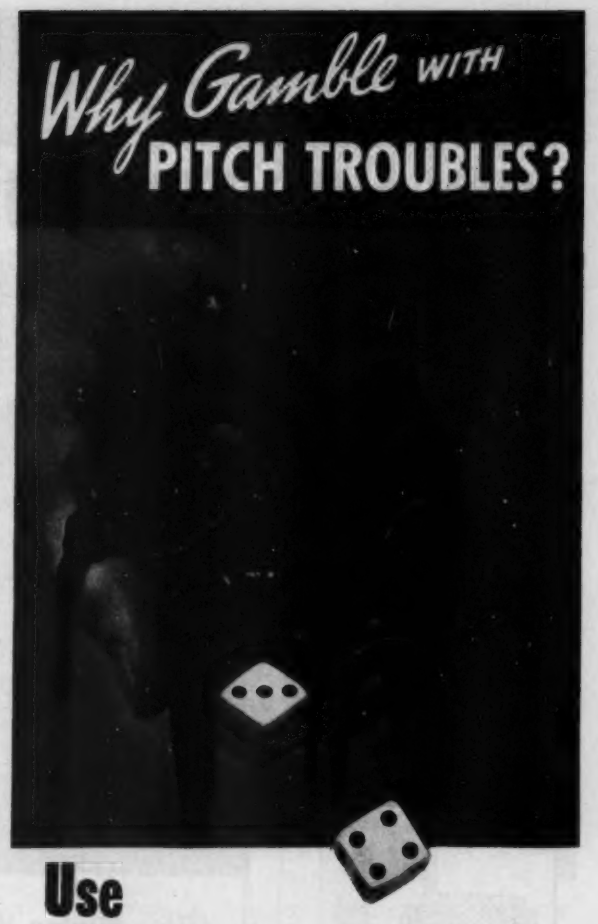
	PARTICIPANT	MILL	LOCATION
GROUP A			
GROUP B	Southern Kraft Corporation	Continental Div.	York Haven, Pa.
GROUP C			
GROUP D	Southern Extract Co.	Knoxville	Tennessee
	Bird & Son, Inc.	Phillipsdale	Rhode Island
	Rogers Fibre Co., Inc.	Bar Mills	Maine
	The Mead Corporation	Nashville	Tennessee
	Central Fibre Products Co.	Vincennes	Indiana
	International Paper Co.	Riley Mill	Riley, Maine
	Central Fibre Products Co.	Mt. Carmel	Illinois
	Hollingsworth & Whitney Co.	Abenaquis Mill	Madison, Maine
	Division II		
	Container Corp. of America	Chicago	Illinois
	Container Corp. of America	Anderson	Indiana
	Bemis Bros. Bag Co.	East Pepperell	Massachusetts

IMPERFECT SCORES

	Key Number	Rank	Disabling Injuries	Frequency Rate
GROUP A	P-108	1	5	2.644
	P- 10	2	3	2.742
	P- 28	3	11	3.494
	P- 27	4	7	3.658
	P-121	5	5	4.402
	P- 25	6	5	6.154
	P- 30	7	9	6.772
	P- 19	8	7	6.808
	P- 13	9	9	7.312
	P- 21	10	7	8.536
	P- 58	11	8	8.694
	P- 12	12	9	8.891
	P- 23	13	9	9.076
	P- 18	14	15	9.550
	P- 2	15	10	10.026
	P- 9	16	20	10.032
	P- 44	17	14	10.951
	P- 84	18	16	11.653
	P- 60	19	14	11.835
	P- 62	20	18	12.549
	P- 67	21	26	13.837
	P- 64	22	19	14.102
	P- 1	23	29	14.129
	P- 87	24	22	17.099
	P-101	25	19	17.902
	P- 7?	26	33	19.877
	P- 9?	27	23	24.446
	P-127	28	24	24.913
	P-102	29	36	27.311
	P- 40	30	31	34.508
	P-126	31	83	35.538
	P- 71	32	46	47.414
	P- 32	33	49	54.758
GROUP B	P- 60	2	1	1.511
	P- 15	3	1	1.715
	P- 51	4	1	1.837
	P- 72	5	3	4.966
	P- 26	6	4	5.392
	P- 68	7	4	5.577
	P- 59	8	4	7.464
	P-112	9	5	7.522
	P- 3	10	5	8.081
	P- 22	11	8	10.127
	P- 11	12	8	10.308
	P- 70	13	8	11.193
	P- 4	14	8	14.726
	P-107	15	13	17.728
	P-104	16	14	25.250
	P-120	17	15	27.499
	P-122	18	19	28.992
	P- 16	19	19	30.009
	P-128	20	24	34.678
	P-124	21	22	36.984
	P- 82	22	25	37.121
	P- 45	23	38	47.529
	P- 46	24	29	48.379
	P-123	25	38	57.852

	Key Number	Rank	Disabling Injuries	Frequency Rate
GROUP C	P- 97	1	1	2.313
	P- 55	2	2	4.331
	P- 88	3	2	4.679
	P- 89	4	2	5.377
	P- 52	5	2	5.516
	P- 56	6	2	5.614
	P- 61	7	4	10.526
	P- 37	8	5	11.557
	P-103	9	4	13.307
	P- 14	10	4	13.565
	P- 41	11	6	16.609
	P- 94	12	5	18.358
	P- 43	13	7	22.229
	P- 49	14	6	24.011
	P- 34	15	9	27.150
	P- 29	16	13	30.663
	P- 39	17	15	33.347
	P- 50	18	11	39.308
	P- 17	19	13	41.838
	P- 80	20	11	45.215
	P-111	21	11	46.689
	P- 33	22	18	50.183
	P-113	23	23	57.309
	P- 47	24	24	66.171
	P- 48	25	32	73.765
GROUP D	P- 90	9	1	6.327
	P- 93	10	1	7.305
	P-117	11	2	10.445
	P- 98	12	2	11.410
	P-109	13	2	16.260
	P-116	14	4	16.843
	P- 5	15	4	17.597
	P- 86	16	2	18.089
	P- 85	17	1	19.500
	P- 36	18	4	23.223
	P- 99	19	3	24.027
	P- 91	20	6	25.971
	P- 6	21	7	30.709
	P- 81	22	6	32.873
	P- 42	23	5	35.135
	P-106	24	7	36.298
	P- 53	25	6	37.050
	P-125	26	5	44.762
	P-118	27	7	44.972
	P-105	28	8	62.176
	P-129	29	30	136.006
	Division II			
	R-20	4	2	2.401
	R-19	5	1	3.210
	R- 6	6	3	3.396
	R- 2	7	3	5.353
	R-15	8	1	9.349
	R- 3	9	2	11.529
	R- 1	10	4	11.836
	R-21	11	8	12.780
	R-13	12	3	16.245
	R-18	13	4	16.512
	R-11	14	3	17.804
	R- 5	15	12	18.020
	R-14	16	3	44.015

Report delayed—six months' total only: P-120, P-111.
Withdrawn:
P-54, P-63, P-74, P-75, P-76, P-77, P-83, P-92, P-100, P-105, P-115.



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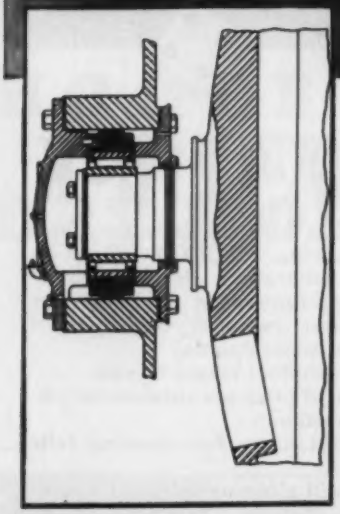
WHY WEYERHAUSER HAS HYATTS



Cross section of dryer roll housing showing application of Hyatt Hy-Load Solid Roller Radial Bearing.

This Minton Vacuum Dryer built by Rice, Barton & Fales for Weyerhauser Timber Co., Everett, Washington, Employs Hyatt Roller Bearings on the Dryers

The Hyatt bearing provides the simplest, most correct anti-friction bearing application for paper dryer cylinders. It meets the requirements of all engineers in the paper industry. Years of successful operating experience prove the correctness of Hyatt design features.

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No cramping action or strain can occur in a Hyatt mounting due to heat reactions. This means long bearing life and uninterrupted production.

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HYATT ROLLER BEARINGS

POWER

GENERATION + UTILIZATION + MAINTENANCE

This section turns the searchlight on power and its allied problems, showing big possibilities to save. Opportunities to improve conditions, methods, apparatus will be discovered. Worth while practices suggest new ideas and wider usages of equipment.

By W. S. JOULE

◆ Flue Gas Temperature an Important Guide

Great care is required in taking temperature measurements of flue gases, as errors of considerable magnitude may result from radiation effects and improper placing of the thermometers. The bulb must be placed directly in the path of the moving gases and must remain in place sufficiently long to assume the full temperature of the gases.

As radiation is the chief cause of error, it is advisable to protect the thermometer or pyrometer bulb by shields or petticoats. By placing the thermometer within a hood of a nonconducting material through which the gases circulate, the radiation error can be reduced to a negligible quantity, although this method does not necessarily give the average temperature of the flue gases, because of their possible stratification.

In practice, it is usual to maintain a temperature of about 400 deg. Fahr. in the uptake of the boiler when natural draft is employed upon the furnace. When forced draft is employed, the temperature of the waste gases can be reduced to about 300 deg. Fahr., as the draft is not dependent upon the weight of the gas and that of atmosphere.

◆ Initial Filling of Turbine Lubricating System

Upon the completion of a steam turbine installation and before the initial filling of the circulating lubrication system has been made, every precaution should be taken to remove all possible grit, scale, core sand, waste, chips, fillings, and other foreign matter from the system. All reservoirs, tanks, pumps, coils and oil lines should be thoroughly washed out with distillate and carefully cleaned and dried. Such precaution will remove a large part of the foreign matter in the system and will invariably prevent much future difficulty and possible injury to the bearings that is sure to result from a careless and negligent start.

For the initial run, the system should then be filled with a high grade turbine oil. After starting the turbine, close and constant attention should be paid to the lubricating system and note taken of the temperatures, viscosity of the oil, and it color and clearness. After a period of 150 hr. operation, the entire initial charge of oil should be removed from the circulating system and the entire system should again be thoroughly cleaned. The second cleaning at this time is necessary on account of the penetrating and cleaning effect of the hot turbine oil, which will loosen scale and foreign matter that was not removable at the time of the first cleaning.

A new charge of turbine oil should then be put in and the operation of the turbine resumed. The removed oil should be put through a good filter, and after all air, water, dirt and other foreign matter have been removed, it may be used for subsequent make-up additions. Should this initial charge contain a large quantity of impurities, the filtering of the oil will be facilitated by the use of a steam-heated separating tank.

◆ Diesel Engine Lubrication

Probably no more difficult problem exists in the field of lubrication than that for the Diesel engine. It is not, however, a problem which cannot be solved successfully, if the operating engineer will study the problem and employ good practice for its solution. The problem involves high working pressures on journals and bearings, air compressor cylinder lubrication, combustion engine cylinder lubrication and the maintenance of a somewhat elaborate system for the distribution of the lubricant.

Method and point of application must be given careful consideration. An oil which will give satisfaction, if applied at the proper time, place and in the right quantity, will be declared unsuitable, if the lubrication system is faulty or inadequate. Lubricants which, under favorable conditions, will well serve their purpose, may suddenly appear to have become unsatisfactory. In this case, it is reasonable to assume that the oil is not necessarily to blame but that the lubricating system has not been maintained in proper operating condition and that some condition has arisen which is seriously interfering with the use of that oil.

◆ Full Time Efficiency

To obtain the most satisfactory and efficient operation of a boiler plant, it is imperative that good practice be put into force for the full time that the plant is in service.

Conditions are not right in any plant when the day crew establishes a good record of operation only to have it offset by haphazard and indifferent methods of men on the night shift. In most of the cases where this condition prevails an explanation may be offered that smoke ordinances hold a check upon wasteful practices during the hours of daylight. It is during this period that violations of the law are most likely to be detected. Under the cover of darkness the best interests of all concerned are overlooked simply because the men do not comply with the law when they feel that they are not being watched. This is but an instance of the condition which has become a criticism of the times, namely that there is an alarming disrespect for the law.

What is the effect of this attitude? In the first place, it is contributing to discomfort, ill health and property damage in the community, and second, it shows that the men in charge of these plants are neither giving the best to those by whom they are employed nor to the community in which they reside.

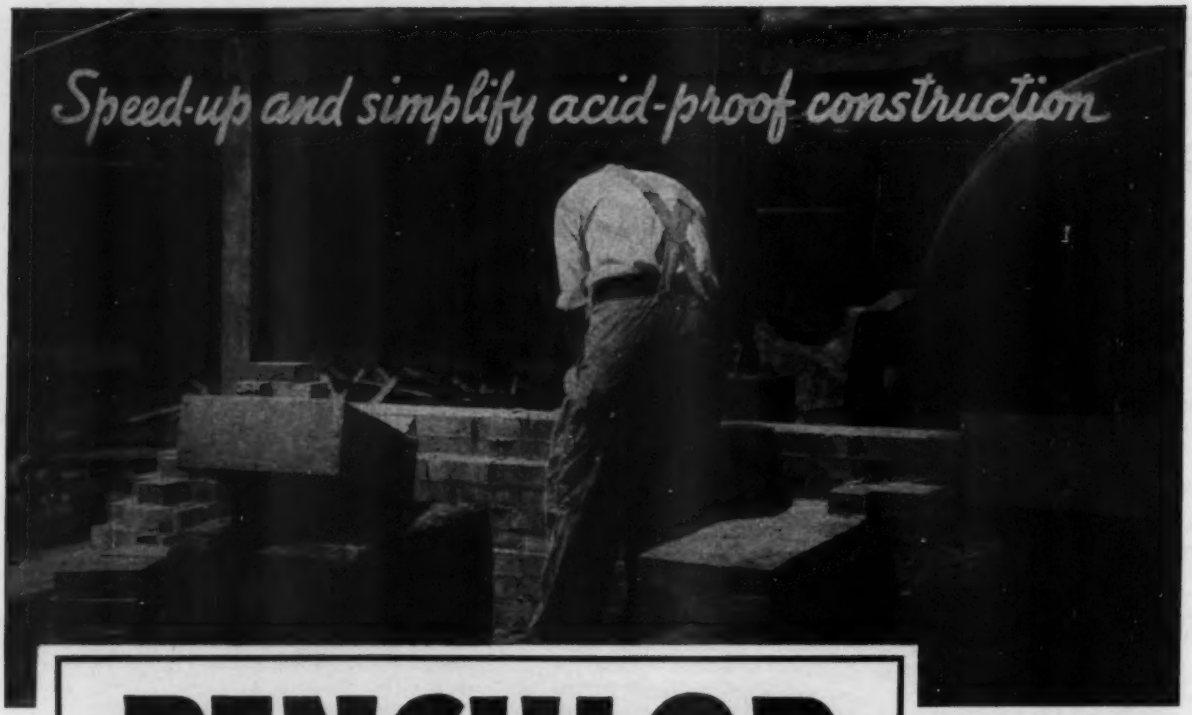
This is a condition which is difficult to change and it is probable that it can be overcome only by keeping a strict record of night operation and making direct appeal to the operators' personal pride.

◆ CHANGES OF DAMPER POSITION should be made gradually. During periods of high steam pressure, the damper should not be closed entirely off in order to let the pressure drop; nor should the damper be opened full to get the pressure up. This causes the draft and air supply to vary excessively. Automatic damper regulators that are not properly adjusted cause similar variations.

◆ What British Thermal Unit Means

In order to express the heat content of a substance it has been necessary to establish a unit of quantity of heat. This unit is known as the British thermal unit (abbreviated B.t.u.) and it is defined as $\frac{1}{180}$ of the quantity of heat which will raise 1 lb. of pure water from 32 deg. F. to 212 deg. F. at atmospheric pressure. For extreme accuracy in defining the unit of heat it is necessary to specify the temperature of the water because the amount of heat necessary to raise the temperature of 1 lb. of water through 1 deg. varies slightly at different temperatures.

This variation is so slight, however, that for most practical problems the B.t.u. may be taken as the quantity of heat required to raise the temperature of 1 lb. of water 1 deg., without any reference being made to any particular temperature.



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QUICK-SETTING and self-hardening, Penchlor Acid-Proof Cement needs no artificial heating or drying. It hardens throughout by chemical reaction rather than evaporation.

The initial set occurs in approximately 30 minutes, making it possible to lay one course on another without loss of time. In only two or three days the tank or other equipment is ready to go into service.

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TECHNICAL DEVELOPMENTS

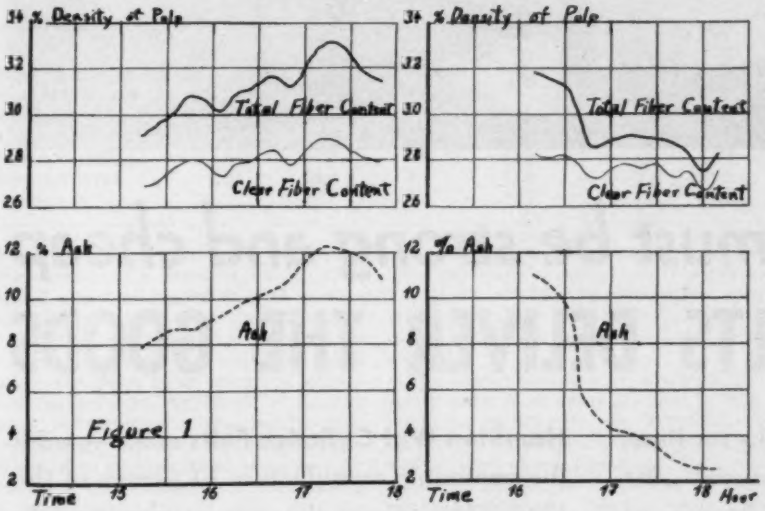
The following abstracts are of the latest developments found in the foreign press.

IN THE PAPER INDUSTRY

◆ Filler Content and Technological Properties of Paper

In these two papers of an extensive series the author discusses the influence of filler content on the behavior of fiber suspensions, on dewatering and drying, and on the structural properties of the paper.

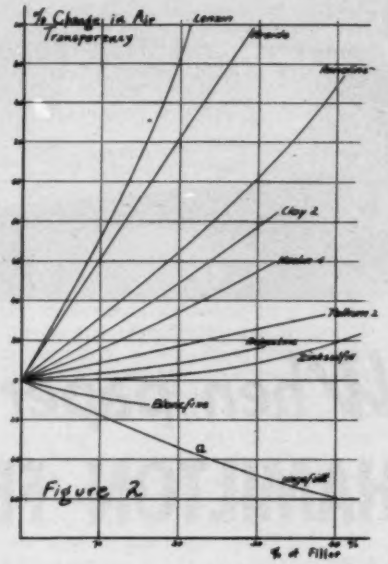
Addition of fillers considerably influences both the internal and external friction of fiber suspensions. Resistance to passage of stock through a pipe is taken as a measure of external friction, and it is found that the addition of filler



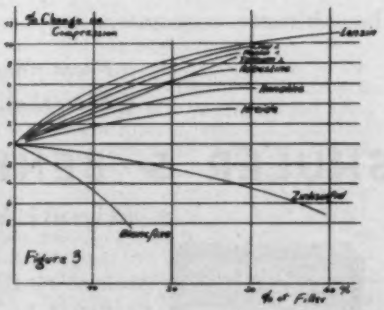
to a suspension containing a constant percentage of fiber decreases this resistance, despite the higher concentration of total solids. In practice, this means a saving in power required for pumping. A measure of internal friction is obtained by measuring the torque of an electric motor driving a stirrer at constant speed in the stock, and by this method it is found that addition of fillers to a fiber suspension of constant consistency causes no increase in internal friction, although total solids concentration is again increased. The speed of travel of a 5 per cent pulp suspension in an experimental beater was found to be increased slightly by additions of fillers, a 3 per cent suspension showed no change. In all these experiments kaolin, up to 30-50 per cent of the fiber weight, was used as the filler. Since most consistency regulators depend on the internal friction of the stock for operation, their results are influenced by filler additions. Mill tests were made using a Trimbey regulator, and the results are shown by the accompanying graphs in Figure 1. In these, the lower dotted line represents the change in per cent ash, thus in filler content, the upper thin line the change in actual fiber concentration, and the thick line the change in total solids concentration at a point well past the regulator. The curves on the left show the changes when filler addition was begun, those on the right the changes when it was discontinued.

Sheets of the same weight were made with and without filler, and pressed under the same conditions. It was found that the filled sheets could be pressed to about 8 per cent greater O.D. content than unfilled, due to the difference in the tenacities with which cellulose and fillers retain water. Studies of the speed of drying of pure filler, sheets with 20 per cent filler, and unfilled sheets, show that the presence of filler considerably hastens drying.

Series of sheets were prepared containing equal fiber weights and varying percentages of various fillers and determinations made of their structural properties. Increase in basis weight was found to be slightly more than linear as filler content increased. Caliper of sheets of the same basis weight was found to be less for filled than unfilled sheets, the difference varying directly with the percentage and specific gravity of the filler. Apparent density of filled sheets was also greater, depending on percentage and specific gravity of the filler. Actual density of sheet structure, as measured by air content, depended on the specific gravity and particle size of the fillers employed; fillers with small particle size and high specific gravity yielded denser sheets than lighter fillers with larger particle sizes. Air porosity was found to vary in an inverse ratio to the actual density. Softness, as measured by compressibility, was greater when fillers, with the exception of blanc fixe, were present. The gloss of glazed filled and unfilled papers was measured with the



Bekk tester and found to increase with filler content, the increase being roughly an inverse function of particle size. Graphs showing the changes in all these properties for nine fillers over the range of 0-40 per cent filler content are included in the study. In the accompanying graphs, Figure 2 shows the changes



in air porosity with increasing filler content, and Figure 3 the changes in softness. In these, lenzin represents gypsum, kreide, chalk, annaline, a $CaSO_4$ preparation, and talkum, talc. Brecht & Pfretzschner, Papierfabr. 35, (Tech. Teil) 73-80, 85-92 (1937).

When paper must be strong and cheap
HAMILTON FELTS DELIVER THE GOODS

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Hamilton Felts

◆ Uses and Limitations of Some Paper Testing Instruments

Paper testing instruments are used in mill control to insure uniformity or duplication, in matching samples, in specifying requirements, and for research in process variables or new product development. Their general limitations may include the questionable relationship of results to use requirements, personal variables in operation, variables in the machine itself due to wear, etc., and lack of an absolute standard for checking. Paper scales should be checked frequently against standard weights. Tensile strength and stretch determinations are useful in separating the factors involved in burst figures, and particularly in studying process variables. The tensile machine can be accurately calibrated in absolute units by using weights and by checking stretch figures by measurements, and is thus well suited for measurements in absolute units. Controlled speed of operation, and correct sample size and insertion are important.

Bursting strength determination gives a very convenient and rapid strength figure, but there is no means of distinguishing between the effects of various paper characteristics, the results may vary greatly with condition of apparatus and method of operation, absolute calibration is very difficult, and relationship to use requirements is often very obscure without additional tests. The author's work using Mullen testers he finds that the rate of pressure increase in the last 10 per cent of the pressure range is most important, rapid increase giving high results, as indicated by the data in Table 2; and that a replacement of diaphrams, or reasonable variations in clamping pressure had little effect except in 0-1000 lb. Mullen testers, where diaphram elasticity becomes somewhat greater after use. Figures are cited which indicate that the personal factor in operating is very large.

The tearing resistance test gives considerable information in a short time, particularly in combination with Mullen or tensile tests; it acts over several inches of paper, giving a better average test than burst or tensile, and is a good measure of "toughness." However, results are particularly influenced by moisture, to some extent by number of sheets torn and to a great extent by stiffness, and no measurement of the force required for initial tear is possible. The Marx and Thwing instruments give fairly comparable results, but the Marx tester is believed to be somewhat more accurate.

The Gurley densometer is the air porosity tester most generally used in England. Its results give an indication of variations in calendering, roll pressures, sizing, and sheet formation, and are generally related to absorption of non-aqueous materials. Personal error and variations due to wear are slight with the Gurley instrument if it is accurately leveled and clamped. The instrument should be used with a non-hygroscopic liquid, and the density of the liquid has little or no effect. An airtight joint must be made in clamping the sample; a soft rubber washer has been found satisfactory for mill work, and a thin vaseline film for exact laboratory work. Readings taken between the 0-50 cc. and the 300-350 cc. marks on the cylinder using the same sheet showed 1.1 sec. longer in a total of 33 sec. were required in the 300-350 range.

TABLE 1

Material—	Schopper-Dalen	Average deviation	Ashcroft Value	Average deviation per cent	Ratio; Ashcroft-Schopper
Blotting paper	11.5	5.5	15.5	3.5	1.35
Greaseproof	16.6	4.0	21.3	4.4	1.29
Cellophane	23.7	3.1	28.5	5.8	1.20
M. G. Kraft	33.5	6.0	37.8	5.7	1.13
Glazed cartridge	33.9	6.0	41.6	6.4	1.23
Unglazed Kraft	52.0	4.8	67.0	5.3	1.29
Chip-board	75.7	4.8	94.4	4.8	1.25

TABLE 2

Unglazed Kraft

Method of Operation—	Burst, Schopper
Uniform fast 25 lb./sec.	59.4
Uniform medium 10 lb./sec.	57.8
Uniform slow 5 lb./sec.	56.6
Uniform very slow 2 lb./sec.	55.2
10 lb./sec. up to 45 lb., then 2 lb./sec.	55.5
25 lb./sec. up to 45 lb., then 2 lb./sec. (probable speed variations large)	56.1
2 lb./sec. up to 45 lb., then 10 lb./sec.	57.2
2 lb./sec. up to 45 lb., then 25 lb./sec.	59.0

Ashcroft instrument measures shearing action around the circumference of a small circle, thus its results are essentially different from Mullen results. The ratio of Ashcroft burst to Mullen varies with sheet type and formation, but this is due to their fundamental differences. Average deviation and Ashcroft Schopper ratios for several types of paper are listed in Table 1. The Ashcroft instrument is portable and convenient, but extremely difficult to standardize. In the

The effects of changes in relative humidity are shown by the following rough averages of variations in paper properties, using 65 per cent r.h. as a base:

	35% r.h.	85% r.h.
Basis weight	— 4%	+ 6%
Caliper (board)	— 3%	+ 6%
Burst	+ 6%	—12%
Tensile	+10%	—15%
Stretch	—35%	+60%
Tear	—20%	+25%
Fold	—70%	+40%
Rigidity (board)	+13%	—25%

These figures may vary very greatly. The author has found that previous history of the paper sheet considerably influences its moisture content in equilibrium with a standard atmosphere. very dry papers can take up less water. Ainslie, Paper Maker & Brit. Paper Trade J. 93, TS 26-31 (1937).

◆ New Method for Determining Hardness of Sulphite Pulps

The present methods of determining the hardness of sulphite pulps are based either on the oxidation or chlorination of the lignin. In these determinations the exact reactions taking place are not known, and reproducible results are obtained only when experimental conditions are held strictly constant. Long reaction times are necessary to insure complete reaction, the shortest method requiring one hour, which is too long for process control. Precipitation of soluble lignin sulphonic acids with organic amines has been found to involve stoichiometric relationships, and this is true also of insoluble lignin sulphonic acids retained in the pulp, harder pulps combined with larger quantities of amines than softer pulps, and when known quantities of pulp and amine have been used, the excess of amine can be determined by titration and a measure of the pulp hardness obtained. Back titration by diazotization or bromate-bromide titration is unsatisfactory due principally to the inaccuracy of the spot plate end point, but if benzidine is used as the amine its difficulty soluble sulphate salt can be easily isolated, hydrolyzed, and the acid titrated.

The authors employ benzidine in the form of its hydrochloride salt. This is allowed to act on a sample of the pulp, the mixture filtered, and the benzidine sulphate precipitated from an aliquot portion of the filtrate with sodium sulphate solution, adding some barium chloride to make the sulphate precipitate heavy enough to centrifuge. After centrifuging, the liquor is decanted and the residue titrated with standard caustic. Titration of the benzidine sulphate salt is complete only at elevated temperatures, but if this is converted to the hydrochloride salt by the addition of $BaCl_2$, titration is complete at room temperature.

The influence of variations of temperature, time, and composition of the benzidine hydrochloride solution has

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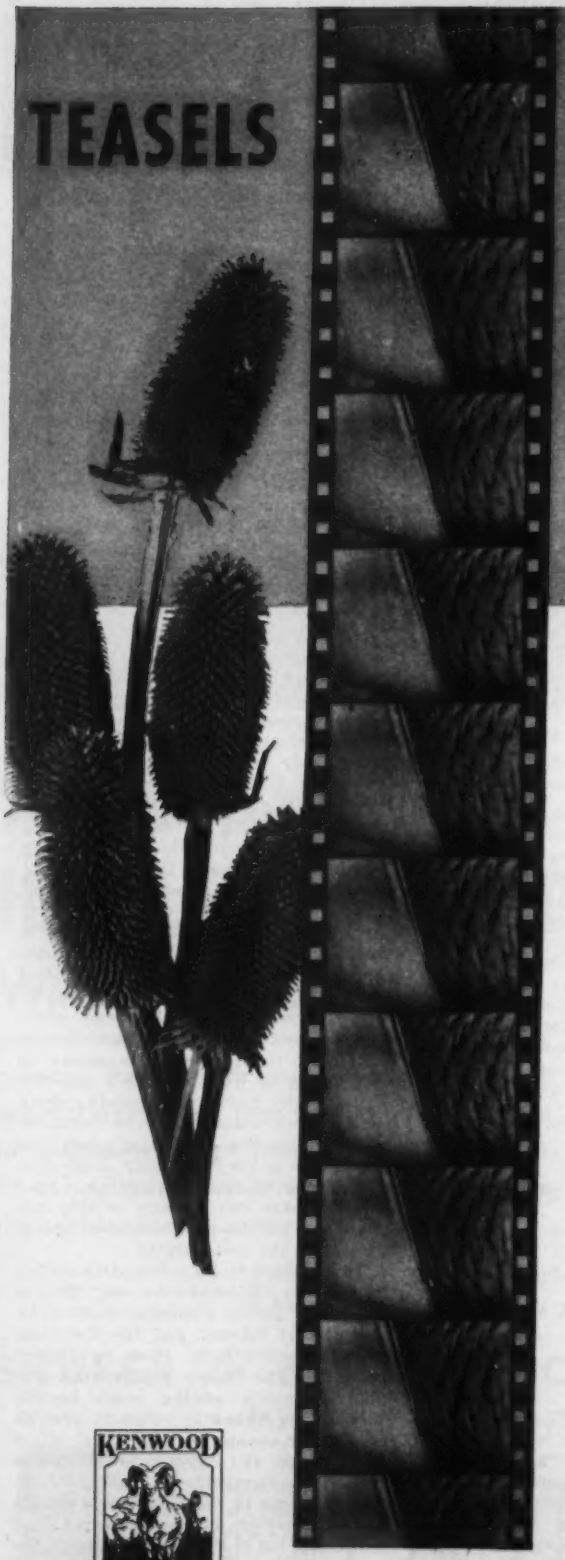

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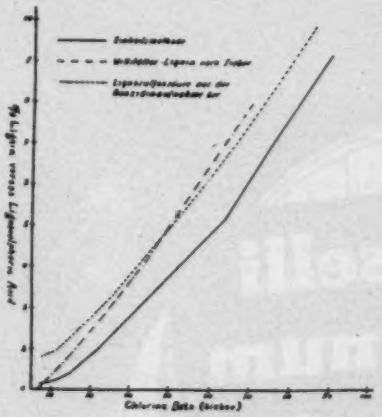
been investigated. The reaction is completed within a certain minimum time, 5 minutes being sufficient for wet pulps and one-half hour for dry pulps. Temperature variations between 15 deg. and 35 deg. C. have no effect on the results. An excess of benzidine must always be present, but the recommended quantities suffice. The HCl content of the benzidine solution must be kept constant, since an excess of HCl interferes with quantitative reaction. Results are reproducible within .15 cc. of N/10 NaOH per 10 g. of pulp, and can be repeated even after the pulps have been machine dried and stored for several months.

Comparison of the Sieber chlorine numbers of numerous pulps with the benzidine absorption figure shows these to be directly related. Earlier investigations of soluble lignin sulphonic acids have shown that each molecule (m. w. approx. 485) is capable of absorbing 4 molecules of benzidine. The lignin content of pulps calculated on this basis from benzidine absorption figures is in agreement with lignin estimation by other methods, as shown in the accom-



panying figure where chlorine consumption by the German standard method, Sieber chlorine number, and benzidine absorption are plotted against calculated lignin content. For practical purposes, benzidine absorption can be expressed as cc. N/10 NaOH per 10 g. of pulp, and this is designated as the amine number. Its relation to the German standard hardness classification is shown in Table 1.

TABLE 1

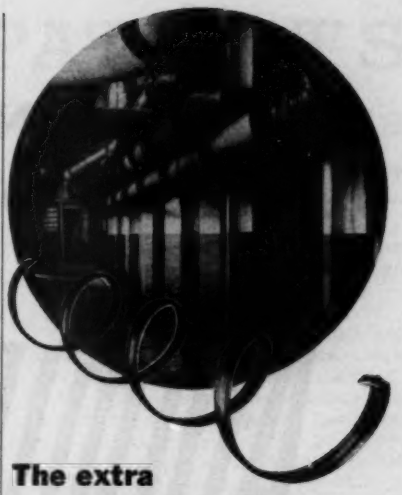
Hardness	Amine number
Very soft	4 or less
Soft	4 — 5.3
Fairly soft	5.3— 6.5
Normally soft	6.5— 8.8
Normal	8.8—10.8
Normally hard	10.8—13
Fairly hard	13.—14.4
Hard	14.4—17.4
Very hard	17.4—26

The analysis requires about 20 minutes on wet pulp, and can be performed by untrained men since the experimental conditions are not extremely rigid. The benzidine stock solution contains 45 g. of pure benzidine and 55 cc. of concentrated HCl (d=1.19) per liter. This is analyzed by diluting 3 cc. in a 100 cc. centrifuge tube with 65 cc. of water, adding 15 cc. of 20 per cent Na_2SO_4 solution and 2 cc. of 10 per cent $BaCl_2$ solution, centrifuging, decanting the liquor completely, and titrating the precipitate with N/10 NaOH after the addition of 10-20 cc. of 10 per cent $BaCl_2$ solution (titration a). HCl in the stock solution is determined by diluting 3 cc. with 65 cc. of water and titrating with N/10 NaOH and phenolphthalein (titration b). The standard benzidine solution is prepared by diluting (3000/a) cc. of the benzidine solution and 40-100 $\left(\frac{b-a}{a}\right)$ cc. of N/1 HCl to 2000 cc. with water containing 10 g. $BaCl_2$. This solution should be checked by determining the benzidine content as outlined above, and the benzidine content adjusted until 100 cc. of the solution is equivalent to 50 cc. of N/10 NaOH. Its HCl content should also be checked, and adjusted until 100 cc. is equivalent to 70—1.0 cc. N/10 NaOH.

The determination of the amine number is carried out by mixing 100 cc. of the standard benzidine solution with 10 g. of pulp (a.d. basis), adding sufficient water to bring the total water content up to 225 cc., stirring for 5 minutes for wet pulps or 30 minutes for dry pulps, filtering and pressing on a Buchner. 75 cc. of the filtrate is then mixed in a 100 cc. centrifuge tube with 10 cc. of 20 per cent Na_2SO_4 solution and centrifuged for 5-10 minutes, the liquid carefully decanted, and the precipitate titrated with N/10 NaOH as previously described. The amine number equals 50–(3 x titration). If no centrifuge is available, the solution containing the benzidine sulphate precipitate can be filtered through a 12 cm. hardened filter paper, and the beaker washed out with part of the filtrate. After the filter has run dry, the precipitate is washed with 10 cc. of 5 per cent Na_2SO_4 solution, and the precipitate washed through the punctured filter paper with boiling water and titrated as before after $BaCl_2$ addition. Tables summarizing the results of the experimental work are included. Nippe, Papierfabr. 35, 60-7 (1937).

◆ Sizing Tests

The general methods used in sizing tests are briefly reviewed. In penetration tests, an amount of liquid normally used in writing is applied to the paper, and the time required for penetration is measured. In absorption tests, much larger quantities of liquid are used. Quality of sizing may be differentiated from mere quantity by a test similar to the "feathering" test. All sizing tests should be made with a liquid customarily used for writing on the paper. Iron-tannin ink is essentially a suspension, and thus differs from water or electrolytic solutions. Careful control of humidity and moisture content of sheets is necessary in sizing tests. Strachan, Paper Maker & Brit. Paper Trade J. 93, TS 17-8 (1937).



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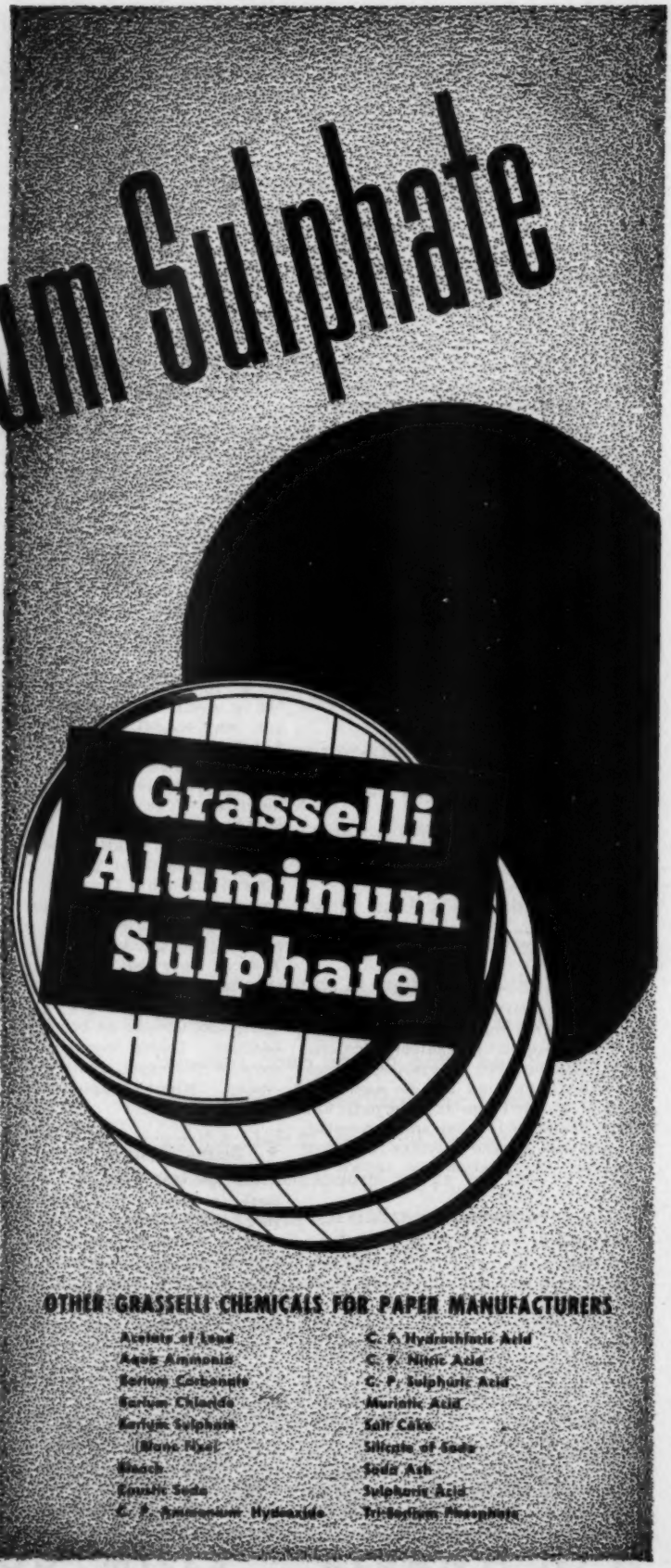

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PAPERMAKING PATENTS

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Compiled by James Atkins, Registered Patent Attorney

2,062,471—Apparatus for the Manufacture of Paper. James M. Murray, Mount Vernon, N. Y., assignor to International Paper Company, New York, N. Y., a corporation of New York. Application January 29, 1935. Serial No. 3,962. 4 Claims. (Cl. 92—44.) In a paper machine, a head box, means to convey stock thereto, a forming wire, means for conveying stock from said head box to said wire comprising a downwardly inclined nozzle having converging side walls, flow evening means located adjacent the inlet end of said nozzle and means in said head box to prevent the surging of stock against said evening means.

2,062,563—Process for the Manufacture of Paper. Albert Edward Harold Fair, St. Catharines, Ontario, Canada. Application March 7, 1934. Serial No. 714,491. In Canada June 16, 1933. 1 Claim. (Cl. 92—40.) The process of adding filler suspension to a fibre suspension on the Fourdrinier of a paper machine consisting in spraying the said filler suspension in a finely divided state against an inclined baffle and thence flowing the same by gravity on to the top of the fibre suspension on the Fourdrinier in such manner as to insure even distribution of filler suspension and the elimination of foam and bubbles in the fibre suspension.

2,064,647—Paper Manufacture. George S. Carroll Chicopee, Mass. Application January 11, 1936. Serial No. 58,724. 3 Claims. (Cl. 34—24.) The method of drying paper which consists in, leading a web of paper into the leading in end of a dryer including spaced upper and lower rows of hollow drying cylinders so that said web has its opposite sides contacted alternately with cylinders of the upper and lower rows of cylinders, maintaining a certain number of the cylinders of one row at substantially one certain temperature and adjacent cylinders of the other row at substantially a different temperature, whereby one side of the web contacts cylinders of one temperature and the other side of said web contacts cylinders of a different temperature.

2,064,776 — Method of and Apparatus for Maintaining Uniformity in Paper Coatings. Alfred D. Wilkinson and John R. Fanselow, Appleton, Wis., assignors, by mesne assignments, to K. C. M. Company, Dayton, Ohio, a corporation of Delaware. Application July 31, 1933. Serial No. 682,926. 6 Claims. (Cl. 91—49.) Apparatus for maintaining uniformity in a paper coating mixture containing an insoluble ingredient, comprising, in combination with a pair of press rolls, a supply trough associated with one of said press rolls, a supply tank for the coating mixture, a gravity flow line including a float-controlled head box leading from said tank to said trough, an overhead settling tank equipped with a sediment discharge device, an over-flow line including a head box leading from said trough to said settling tank, a pump in said over-flow line beyond and controlled by said last-named head box, and a flow line leading from said settling tank to said first-named head box.

2,065,189—Paper Finishing Machine. Frank C. Ladd, Turners Falls, Mass. Application October 27, 1934, Serial No. 750,313. 3 Claims. (Cl. 101—23.) A paper finishing machine having two calender hard pressure rolls, at least one of which is composed of a cylindrical outside layer of hard substance, an intermediate layer of comparatively soft and elastic substance, a rigid core body, and a superficial layer of linen cloth bonded over the entire cylindrical working surface of said hard substance to form part of the composite calender roll.

2,065,387—Apparatus for Bleaching Pulp. Mathew F. McCombs and Francis W. Decker, Niagara Falls, N. Y., assignors to Niagara Alkali Company, Niagara Falls, N. Y., a corporation of New York. Application September 5, 1935, Serial No. 39,353. 3 Claims. (Cl. 8—2.) Apparatus for bleaching pulp with chlorin and providing prolonged and intimate contact of chlorin and pulp, said apparatus comprising means for introducing chlorin at a controlled rate into a flowing mass of pulp, an agitator for causing intimate mixture of the pulp with the chlorin so introduced, a container shell, an unrestricted inlet pipe extending to the upper part of the shell and through which the pulp flows upwardly into the shell, a cylindrical partition within the shell and surrounding said inlet pipe, a frusto-conical top for said partition to direct the flowing pulp downwardly in the annular space between the partition and inlet pipe, said partition terminating above the bottom of the shell to provide an unrestricted passage for the pulp therearound whereby it will flow again upwardly between said partition and shell, said container shell, inlet pipe, partition and top being arranged to form an unrestricted progressively expanding passageway for the pulp, a frusto-conical top on said shell, an outlet pipe communicating with said top, means for injecting neutralizing agent into the mass of pulp emerging into the outlet pipe and a mechanical agitator for causing intimate mixture of the pulp and neutralizing agent and for assisting in moving the pulp through said outlet pipe.

2,065,925—Method of Coating and Ornamenting Paper and the Like. Alan M. Overton, Wyoming, and Harry C. Fisher, Cincinnati, Ohio, assignors to The Richardson Company, Lockland, Ohio, a corporation of Ohio. No Drawing. Application March 9, 1932, Serial No. 597,868. 3 Claims. (Cl. 91—70.) A process of treating paper which comprises forming an emulsion of a gummy material and water, containing flocculated and deflocculated particles, heating said emulsion, and applying it to the surface of paper in a thin film.

2,066,107—Method of and Apparatus for Working Paper Stock. Anton J. Haug, Nashua, N. H. Application May 31, 1932, Serial No. 614,566. 9 Claims. (Cl. 92—20.) In a machine of the character described, the combination with a container adapted to hold a quantity of paper stock, or similar material, of a roll for engaging the stock, means supporting said roll for rotation about its own axis in contact with said stock and for movement toward and from the stock supporting surface of said container to cause it to crush said stock against said surface, the peripheral surface of said roll being roughened to maintain substantially a true rolling contact with said stock, and said contact serving as the sole means for revolving said roll around its own axis. In a machine of the character described, the combination of a container having a chamber therein to receive the material to be worked, a roll mounted in said chamber for working said material, mechanism for supporting one end of said roll, said container having a separate chamber in which said mechanism is mounted and including a partition for maintaining said chambers separate, one from the other, and a packing associated with both the partition and said roll for preventing the transfer of material along said roll from one of said chambers to the other, said packing comprising a part in which said shaft is both rotatable and angularly movable, means for continuously maintaining a tight joint between said part and said shaft, and means for continuously maintaining a tight joint between said partition and said part, said part having a movement of translation relatively to said partition.

2,066,369—Woven Wire Belt for Paper Making Machines. Harry G. Specht, Montclair, N. J., assignor to Eastwood-Nealley Corporation, Belleville, N. J., a

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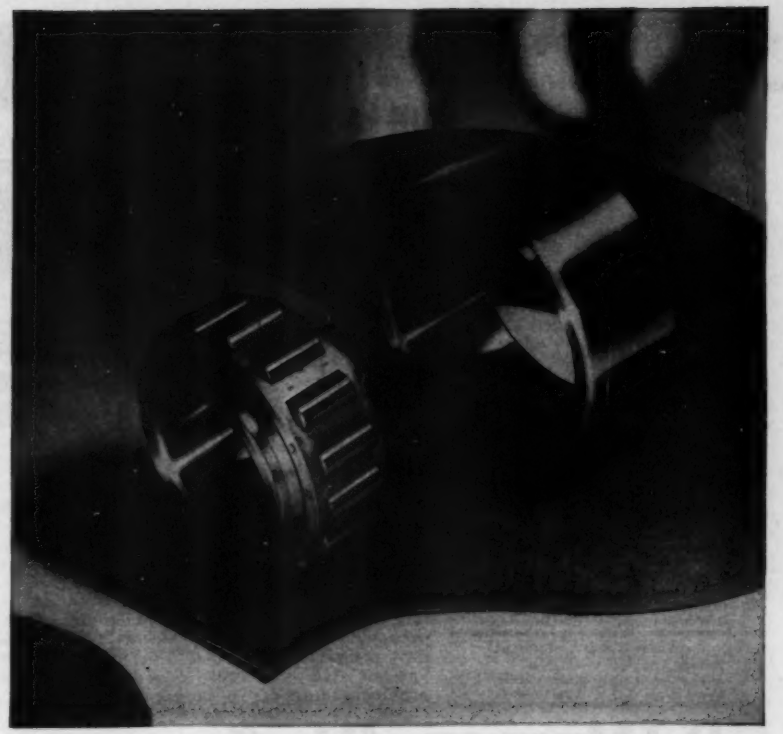
corporation of New Jersey. Application March 17, 1934, Serial No. 716,126. 6 Claims. (Cl. 139—425.) Woven wire cloth for paper making machines, comprising interwoven warp and weft wires, some of said warp wires being of one material and others being reinforcing wires and of a different material, said other warp wires being differently woven in relation to the weft wires than the remainder of the warp wires, said different weave being continued uniformly throughout the length of the woven wire cloth and adapted to compensate for variation in elongation of said different materials whereby elongation of the entire woven wire cloth in the direction of the warp is equalized.

2,066,566—Process of Winding and Cutting Paper into Sizes. Einar Henrik Janson, Amotfors, and Johan Olof Nauclér, Stockholm, Sweden. Application April 30, 1935, Serial No. 19,042. In Sweden May 1, 1934. 5 Claims. (Cl. 164—17.) A process for cutting lots of different kinds of paper to size on a machine capable of simultaneously cutting a plurality of sheets, comprising the steps of making up a number of similar rolls of paper equal to the maximum capacity of the cutting machine, winding onto each roll in similar sequence portions of the different kinds of paper, each said kind of paper being equally distributed among the said rolls, and feeding paper simultaneously from all said rolls to a cutting machine, whereby the different kinds of paper are cut to size in inverse sequence to the initial winding onto the rolls.

2,066,570—Paper Making Machine. Gerould T. Lane and Wendell Butterfield, Rochester, N. Y., assignors, by mesne assignments, to Eastman Kodak Company, Jersey City, N. J., a corporation of New Jersey. Application November 20 1934, Serial No. 753,919. 11 Claims. (Cl. 92—43.) In a paper making machine, the combination with a cylinder, of a flow box in which the cylinder is revolubly mounted, a making wire adapted to move with the cylinder passing around a part of the cylinder and being adapted to pass to and from the cylinder, said wire being guided from the cylinder in a substantially horizontal run, a flow divider mounted in the flow box for dividing the stuff in the flow box into two streams, one stream adjacent the cylinder being adapted to flow out over the top of the making wire as it passes from the cylinder.

2,066,974—Paper Maker's Drier Felt. Thomas Hindle and Sam Lord, Blackburn, England. Application September 23, 1935, Serial No. 41,794. In Great Britain September 27, 1934. 2 Claims. (Cl. 24—33.) A paper maker's drier felt formed from a single length of material constructed with a loop at each end of said length formed by doubling the felt over on itself, a plurality of slots running longitudinally of the felt formed in the edge of each loop at intervals across its width the slots in one loop coinciding in position with those in the other loop, a separated rod of relatively small diameter inserted in each loop and flat links of less thickness than the looped end of the felt surrounding the two rods and connecting them together at the points where they are exposed through the slots thereby forming a seam joining the two ends of the felt in which the links are raised above the lower surface of the felt.

2,067,480—Process of Manufacture of Pulp. Joaquin Julio de la Rosa, Sr., Great Neck, N. Y., assignor to de la Rosa Corporation, Wilmington, Del., a corporation of Delaware. Application July 18, 1935, Serial No. 32,016. 11 Claims. (Cl. 92—7.) A process for the manufacture of pulp from fibrous or cellulose bearing material comprising, wetting the material with a bleaching liquid, subjecting a body of the wetted material to a pressure sufficient to uniformly impregnate the material with the bleaching liquid, wetting the uniformly impregnated material with a wash liquid, subjecting the uniformly impregnated material to a pressure sufficient to displace the greater portion of the bleaching liquid and dissolved matter with the wash liquid and then digesting the material with a cooking liquor to produce pulp of improved color and strength.



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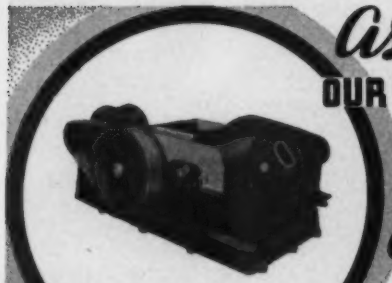

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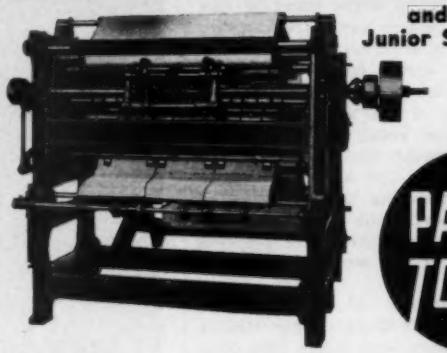

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The COMMERCIAL OUTLOOK

New York, April 1, 1937.

PAPER and board mills are booming along at close to maximum operating capacity and doing all they can to keep up or catch up with orders. Demand has developed no sign of recession, generally speaking; it is possible that as regards certain classes of paper, buying has let down a bit as seasonal influences have set in, but by and large the call for paper and board not alone is holding to the tremendous volume of the last few months but actually is undergoing further expansion.

Orders for paper are no longer a matter of news in the paper industry. The chief concern of manufacturers is in coping with the demands made upon them by their customers; it would seem as if every consumer, converter or distributor is pressing for early deliveries—as if their wants are truly insatiable. The market development of interest and importance at present has to do with prices. Most grades of paper are steadily moving forward quotably. Manufacturers, at last "sitting in the saddle" after years of being obliged to submit to dictation by buyers, and finding their production costs mounting at a pace absolutely requiring action in adjusting prices of their product to conform with the new market set-up, are advancing prices to reasonable lengths.

The all-important most recent move in this connection is announcement that the contract basis on standard newsprint will be $50 per ton for the first six months of 1938. First announcement came from the International Paper Company on March 19, and meanwhile nearly all of the other print paper producers in the United States and Canada have issued similar announcements. Almost immediately after the I. P. made known its intentions regarding prices to its contract customers, five of the largest Canadian newsprint companies announced they would follow the lead of the International and raise their price to $50 in 1938. These companies were the Consolidated, Donnacona, Mersey, Abitibi and J. R. Booth concerns, and soon thereafter the Minnesota and Ontario and St. Lawrence companies fell in line and issued similar announcements. There seems no doubt that the whole industry on the North American Continent will adopt the higher price.

A $50 a ton base price for newsprint for delivery at New York, Chicago and Atlantic and Gulf ports will represent an increase of $7.50 a ton over the prevailing price of $42.50, and should lead to a rehabilitation of the newsprint manufacturing industry which has long been suffering from a non-profitable price level. In 1936 newsprint sold at $41 a ton, New York base, compared to $40 a ton from March 31, 1933, to the end of 1935, except for two months of slightly higher quotations. Before that the price ranged from $45 to $62 a ton, the latter price prevailing throughout 1930, and comparing with $65 a ton before the depression.

Commenting on the price advance announcement, Charles Vining, president of the Canadian Newsprint Association, stated that he considered it "unusual and somewhat surprising" because made so early, and added: "It seems likely that both buyers and sellers will find it constructive, as it will give manufacturers time in which to make definite plans for preparations of machines now shut down, so that additional production may be available when needed to help avoid a shortage of supply and wild spot market conditions." It is expected in Canadian manufacturing circles that by 1938 output may be 10 or possibly 15 per cent larger.

Trade reports say book paper is due for a sizable price rise, following several advances in recent months, and due largely to the soaring wood pulp market. The steady increase in magazine sales and advertising and the entrance of so many new publications into the field have raised book paper mills to fulltime operations. Wrapping paper, tissues and practically all classes of paperboard are understood to be about due to score additional price advances. Wallpaper manufacturers have announced a 5 per cent increase over present prices will be effective on all orders received after April 15 and a 10 per cent increase over present prices on all orders received after May 15. All orders must be for definite quantities and for specified delivery dates.

The monthly index of newspaper advertising for February showed a gain of 8.5 per cent over January this year, according to Printers' Ink. As compared with the same 1936 month it showed a rise of 17 per cent, which is considerably higher than the increase of January, 1937, over January, 1936, of 2.9 per cent.

Production of newsprint in the United States and Canada during February set a new high for that month at 347,604 tons, an increase of 53,783 tons or 18.3 per cent over the 293,821 tons produced by mills in both countries in the similar month last year. The previous high mark for February output in both countries was set in 1930 at 301,548 tons, according to the News Print Service Bureau. The gain in February output was due to the sharp rise in Canadian production, which jumped to 275,532 tons, an increase of 53,963 tons, or 24.4 per cent over a year ago. United States production in February was 72,072 tons, against 72,252 tons in the same 1936 month, while total North American output reached 375,714 tons, contrasted with 317,868 tons in February last year.

Canadian newsprint output during the first two months of the current year totaled 563,223 tons, against 449,524 tons last year in the same period, while mills in the United States produced 152,077 tons, compared with 151,613 tons last year. Total North American production amounted to 771,564 tons in the two months, against 651,532 tons a year ago. Shipments from mills again were smaller than production in February as tonnage accumulated at points from which water shipments will be made upon the opening of navigation. Stocks at mills in both countries at the end of February were 89,764 tons, against 68,240 tons a month earlier, and 108,114 tons at the end of February, 1936.

Paperboard production in the United States in January amounted to 331,386 tons, according to the monthly summary of the Census Bureau, compared with 328,773 tons in the month preceding and 271,210 tons in the same 1936 month. More board was produced in January, 1937, than in any month, with a single exception or in October last, than in any month of the year 1936. Mills produced at 80.4 per cent of rated capacity, against 75.6 in the month before, and 63.4 per cent in January last year. New orders received by manufacturers called for a total of 369,950 tons of board in January, compared with 350,452 tons in December last and 284,854 tons in January a year ago, while unfilled orders held by mills at the close of January were for 182,676 tons, against 130,472 tons a month earlier and 95,358 tons at the end of January, 1936.

Shipments of prepared roofing from mills in the United States in January aggregated 2,386,228 squares of all types, an increase of 43.8 per cent over 1,658,863 squares in the corresponding month last year, and a rise of 63.2 per cent above 1,461,728 squares shipped in the preceding month.

◆ ◆

◆ THE HAYNES STELLITE COMPANY, a unit of Union Carbide and Carbon Corporation, has produced a new motion picture on hard-facing which is now available for showing. A brief description of what hard-facing is and how it is done is given, followed by a series of views of the application of Haynes Stellite with the oxy-acetylene flame. The correct manner of applying this cobalt-chromium-tungsten alloy is pictured as well as views of various industrial applications of hard-facing. Throughout the film emphasis is placed on effective methods of application and the economies resulting from the use of hard-facing.

"NON-USERS ARE THE LOSERS"

TENAX FELTS

FINISH AND SPEED

A Continuous Thaw!

Can you imagine a Spring freshet that continues all year? That's what the production schedule is like nowadays—operating night and day, with more speed and more production being demanded.

Now's the time that TENAX FELTS prove their quality and durability and TENACITY. They justify the care that goes into their manufacture; they justify the judgment of the mill operators who select them.

"Non-Users Are the Losers"

LOCKPORT FELT COMPANY

NEWFANE, N. Y., U. S. A.

LEWELLEN

VARIABLE SPEED TRANSMISSIONS
AUTOMATIC ELECTRICAL CONTROLS

This is a departure from the usual application of the Lewellen Transmission. A manufacturer of sand and crushed stone spreaders, in Connecticut, finds the Lewellen profitable for varying the spread of stone or sand, as conditions require.

Wherever accurate, infinitely variable speed will improve production operations, the Lewellen Transmission will prove a profitable investment. It is never an expense, if you need it, for it will save its cost many times over.

Let Lewellen engineers help work out your variable speed control problem. No cost or obligation.

LEWELLEN MFG. CO.
COLUMBUS, IND.

98 MILLS CUT COSTS WITH KALAMAZOO TANKS

Above: Part of glazed tile stock tank equipment for K. V. P.'s newest machine. Over thirty tile tanks in this one mill.

GLAZED TILE STOCK TANKS

Cleaner, stronger, permanent, and more economical—Kalamazoo glazed tile tanks are helping 98 mills do a better production job at a lower cost. Now is the time to modernize your mill. Write for new brochure.

KALAMAZOO TANK & SILO CO.
KALAMAZOO, MICH.

Domestic RAW MATERIALS

◆ Papermaking Rags

With some exceptions, the various grades of papermaking rags display price firmness and are moving in a consistent manner, chiefly of course to domestic paper mills but in some instances also into export channels. The supply condition, generally speaking, is a supporting factor, and it is not going too far to state that certain descriptions are difficult to locate in other than limited-sized quantities.

When spring arrives it is customary for roofing paper manufacturers to withdraw as buyers from the market, in part if not entirely, while expecting incoming collections of old rags to increase apropos of the house-cleaning season, and awaiting to see if these augmented supplies have effect, in their favor, on prevailing market prices. This is precisely what this group of rag consumers now is doing. There is some demand for roofing rags, mostly domestic stock, but on the whole the market has become much quieter and such purchasing as mills are doing is of a nature which exercises little perceptible influence on the market situation. As a result, roofing rags have developed a softer price tone, as is ordinarily witnessed at this time of the year.

Eastern dealers quote 2 cents per pound f.o.b. New York for No. 1 domestic roofing rags, and 1.90 cents for No. 2 stock. In the Middle West, a little below these prices is reported prevailing on roofing rags, or about 1.85 cents for No. 1 and 1.75 cents for No. 2 f.o.b. shipping points. Imported roofing rags are relatively steadier, and substantially higher in price than domestic corresponding grades. In fact, the foreign situation constitutes something of a bullish factor in the roofing stock position. There is a concerted demand in Europe for these rags and high prices are being paid there, in frequent cases well above a parity with present market levels here. Consequently, dealers on the other side of the Atlantic are not inclined to sell to the United States unless securing proportionately high prices, and importers say it is practically impossible for them to buy abroad at the rates shippers in Europe demand and sell to consumers here at the prices felt manufacturers are willing to grant and break even on transactions. Importers ask 2.25 cents or higher per pound for dark colored cottons ex dock Atlantic seaboard, and up around 2.60 cents for linsey garments, insisting they can scarcely cover abroad at these price levels.

Export demand for some grades of new cotton cuttings continues active, and there is no question foreign buyers are taking considerable quantities of cuttings out of the market here. Cutting prices are firm, almost without exception, and some grades in comparatively restricted supply tend to advance further. Dealers quote 9.25 to 9.50 cents a pound f.o.b. New York for No. 1 new white shirt cuttings, 10 cents for unbleached cuttings, 6.75 or 7 cents for light silesias, 7.50 cents to higher for new blue overall cuttings, 9 cents for bleached canton flannels, 4.50 cents for black silesias, 3.75 cents for fancy shirt cuttings, 7.50 cents for light flannelettes, 11.50 cents for new white linen cuttings, and 11 cents for grey linen.

Old white cottons are moving abroad also to some extent, and are marked by price steadiness. No. 1 repacked whites are quoted at 3.75 to 4 cents per pound at shipping points, No. 2 repacked at 3.25 to 3.50 cents, and No. 1 miscellaneous whites at 3.50 to 3.75 cents. Repacked old blues are 2.50 cents a pound for twos, and 2 to 2.15 cents for thirds.

◆ Old Paper

Reflecting in good part the great strength in wood pulp, waste paper is one of the firmest classes of papermaking material and is in active demand. Market values now are on the highest plane known in a long time, and are still pointed upward decidedly. Board mills are taking supplies in large tonnage, readily snapping up all the stock reaching the market, and there is scarcely enough of some grades to fill buyers' wants. The market is definitely a sellers' market, and dealers are not hesitating to mark up prices as the demand remains unsatisfied.

Kraft grades in particular are high priced and eagerly sought. New kraft envelope cuttings are selling at 3 cents a pound or very close to this price f.o.b. shipping points, while firm bids from mills of 1.85 cents and more for No. 1 old kraft frequently are refused, not so much because sellers are unwilling to accept this price but because they haven't the material to dispose of. Shavings are bringing 2.50 cents upwards a pound for No. 1 hard white, and 2.20 cents to higher for No. 1 soft white, with one-cut soft white worth 2.60 cents. Ledgers are 1.85 to 2 cents for white, and 1.40 to 1.50 cents for colored. Old books and magazines have firmed after a slight downtrend and are selling at 1.15 to 1.25 cents per pound at shipping points. Bulky grades have advanced further in price to 65-70 cents per hundred pounds at shipping points for No. 1 mixed paper, 75-80 cents for folded newspapers, and 85 to 90 cents for old corrugated boxes.

◆ Rope and Bagging

Old manila rope has staged a spectacular price rise to where paper mill bids of 5 cents a pound—or one cent per pound above the last report—for No. 1 domestic old manila, and 5.25 cents for foreign old rope are generally being refused by sellers, who claim they are unable to buy rope to be sold profitably at these figures. The market is strong and there is a growing call for supplies from consumers. Scrap bagging, on the other hand, seems a shade down in price at 2 to 2.15 cents a pound for No. 1 scrap at shipping points, and 1.60 to 1.70 cents for roofing bagging.

◆ Pulpwood

Firmness marks pulpwood, and prices tend upward. Offerings are being readily taken up, and the movement against contracts is steady.

◆ Mechanical Pulp

There are indications that the mechanical pulp market has quieted to some degree, but the undertone is strong, limited tonnages of pulp are on offer and predictions are freely made within the trade of higher prices later in the year. Prices of domestic are around $34 to $35 per ton delivered consuming centers for any current shipments, and Canadian moist groundwood is on about this same quotable level. Relatively high prices from Europe are a support to market quotations here, and make for more demand for domestic and Canadian pulp, which is obtained at slightly under imported groundwood. Scandinavian dry groundwood is reported hard to get at $36 per short ton ex dock U. S. Atlantic ports, many quotations ranging up around $38, which with inland freight added runs prices at consuming points up to a fairly high level.

◆ Chemical Pulp

Higher contract prices for second quarter shipments of domestic sulphite and soda pulps became effective on April 1. Quotations on prime bleached sulphite to contract customers now start at 2.90 cents per pound and on unbleached sulphite at 2.30 cents, ex dock American Atlantic seaboard, while the new basis on bleached soda pulp is 2.90 cents delivered paper mills. These, it may be remarked, are the low bases quoted; some domestic producers quote substantially higher, more especially on unbleached sulphite. Numerous consumers would gladly purchase big tonnages of pulp at these prices if they could get the pulp. These prices are for dyed-in-the-wool contract customers only, and no supply—not a single pound—is to be had in the open market at such rates. The pulp market has lost none of its firmness; it is just as strong as it has been for some while, or stronger, with available pulp for spot or near delivery harder to locate than ever.

◆ Chemicals

Bleaching powder, soda ash, caustic soda, alumina sulphate and most other papermaking chemicals are quotably firm, and in good demand. Casein is a trifle softer in price at 17.50 to 18 cents a pound for domestic and 18.50 to 19 cents for imported. Brimstone is $18 to $23 per long ton, at mines.

APPLETON WIRES ARE GOOD WIRES

YESTERDAY

FINDING SATISFACTION IN THE SOLID

MERIT OF TESTED PRINCIPALS AND A

LONG TRADITION OF GOODNESS AND VALUE.

40 YEARS OF WIRE MAKING BY THE APPLETON WIRE WORKS, INC.
APPLETON, WISCONSIN

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Flexible Couplings
ALL METAL—FORGED STEEL—NO WELDED PARTS

The Poole flexible coupling combines great mechanical strength with an unusual capacity for adapting itself to ordinary shaft misalignments. It has no springs—rubber—pins—bushings—die castings or any flexing materials that require frequent replacement.

Using strong specially treated steel forgings, long wearing gears in constant bath of oil, this coupling eliminates your coupling troubles.

Oil Tight—Dust Proof—Free End Float—Fully Lubricated

Send for a copy of our Flexible Coupling Handbook

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Import and Export MARKETS

IMPORTS

◆ Wood Pulp

While the situation, from a price standpoint, remains equally as strong as in recent months and quotations in most instances continue on the upward move, there are evidences the market for imported wood pulp has quieted to some extent. This may be due perhaps to paper and board manufacturers, realizing fully the extremely tight supply condition existing in pulp, having let down in their efforts to buy since they have learned wanted supplies are not to be had. Nevertheless, there is a ready sale for any tonnages of the various classes of pulp which find their way into the market at anything resembling a reasonable price level, or for delivery a good many months ahead. Moreover, it is apparent a large additional business could be done were the necessary pulp available for trading purposes.

However, pulp consumers are eager to see the market acquire more stability, to start a leveling-off procedure which it is felt must sooner or later come about, and probably figure that if they can manage to keep out of action as buyers for a time, the market may begin to settle. Meanwhile, prices have attained new heights for the current advancing trend. Prime bleached sulphite has sold at 4.25 cents a pound, ex dock American Atlantic seaboard basis, for spot lots or fairly early shipments from aboard, and prime strong unbleached sulphite has brought 2.25 cents ex dock. Prime standard kraft has sold up to 3.20 cents for spot lots, ex dock Atlantic seaboard; shipments for the balance of this year from abroad are quoted on a range of 2.75 to 3 cents, while 1938 kraft has mounted to a quotable level of 2.40 cents. Quotations, which are mainly nominal, now generally run from 3.90 to 4.10 cents or higher on bleached sulphite for this year's shipment from abroad, and 3.25 to 3.50 cents for strong unbleached sulphite and 3.50 to 3.65 cents for easy bleaching sulphite.

Groundwood prices from Europe are above parity with domestic and Canadian quotations, with sellers on the other side of the Atlantic firm. Generally $38 a ton is the minimum named on prime dry Scandinavian groundwood for 1938 dispatch from abroad, ex dock American Atlantic ports, and $36 ex dock is considered a low price for such pulp for the balance of the current year. Some producers firmly quote $37 to $38 for groundwood for the second half of 1937, and up around $39 for next year.

At a recent meeting, the Council of the European Sulphite Organization voted to increase production of sulphite pulp, but no announcement was made as to what extent mills will be permitted to step up their output. Since the market situation is now entirely reversed as compared to the time several years ago when the S.P.S. was formed in Europe, in that there is a definite shortage of pulp, the organization of European producers is thus merely carrying out the same policy of adapting production to consumption when it increases the output of its members.

Wood pulp imports into the United States during January were below the importations in the month preceding and also in the similar month last year, yet were on a fairly high level. A total of 172,137 short tons of 2,000 pounds, air dry weight, of chemical pulp was imported, valued at $6,666,601, according to U. S. Commerce Department reports, contrasted with 192,584 short tons of a declared value of $7,580,197 in December last, and 190,938 short tons of a value of $6,942,442 in January a year ago. Groundwood imports were 18,513 short tons of a value of $323,698 in January, against 23,512 tons valued at $434,160 in the month before, and 18,207 tons of a value of $319,906 in January, 1936.

Total imports of pulp of all classes in January were approximately 9 per cent under the volume of January, 1936, imports.

◆ Paper Stock

For the sixth consecutive year imports of rags for papermaking showed a substantial increase in volume and value during the calendar year 1936 over the preceding year. A total of 275,982,835 pounds, valued at $4,673,041, was imported last year, contrasted with 201,310,993 pounds of a value of $2,411,424 in 1935, and 101,523,797 pounds of a value of $1,282,668 in 1934. This was a gain last year in quantity of 37 per cent over the 1935 receipts, following a rise in 1935 of 98 per cent above the 1934 arrivals. Compared with some earlier years, last year's imports were on the low side, however, as back in 1929 a total of 446,496,028 pounds were imported, and in 1925 imports amounted to 572,431,511 pounds. For the five years, 1925 to 1929, inclusive, annual average imports were well in excess of 400,000,000 pounds.

Importations of miscellaneous paper stock in 1936 reached an aggregate of 103,435,628 pounds, valued at $1,873,639, against 77,800,892 pounds of a declared value of $1,110,652 in 1935.

EXPORTS

The total value of exports of paper and paper products from the United States in January last was $1,922,995, according to U. S. Department of Commerce figures, compared with $1,822,198 in January, 1936. This represents a gain of only 5.5 per cent. Exports of newsprint during January decreased 80 per cent contrasted with the same 1936 month. However, book paper shipments increased by 157.8 per cent in January of this year. Other substantial increases were notable in cover paper, by 72.6 per cent; kraft wrapping, 89.5 per cent; toilet paper, 113 per cent; bristol and bristol board, 56 per cent; miscellaneous paperboard, 45 per cent; fiber insulating board or bats, 48.6 per cent, and boxes and cartons, 46.7 per cent. Tissue and crepe papers, sheathing and building papers, blotting, papetries and vulcanized fiber also showed gains in January as compared with the same month last year. Comparatively few papers, other than newsprint, decreased to any great extent during January. Old and overissue newspapers registered a loss of 51 per cent, boxboard decreased 50.7 per cent, and wallboard 41.5 per cent. Although writing papers declined by 20 per cent in quantity, at the same time their value increased 45.6 per cent. Paperhangings showed a similar trend.

Exports of paper base stocks during January totaled in value $670,003, a rise of approximately 25 per cent over $538,349 during the first month of 1936. The increase in value of exports was general, insofar as class was concerned, no particular base stock accentuating decidedly over another. Pulpwood totaled 573 cords, valued at $3,273 in January, as against 420 cords of a value of $2,520 for the same 1936 month. January wood pulp exports, amounting to 7,998 short tons, showed a decrease of 1,651 tons contrasted with 9,649 tons exported in January, 1936, while the value of these shipments was $518,066 and $449,785, respectively.

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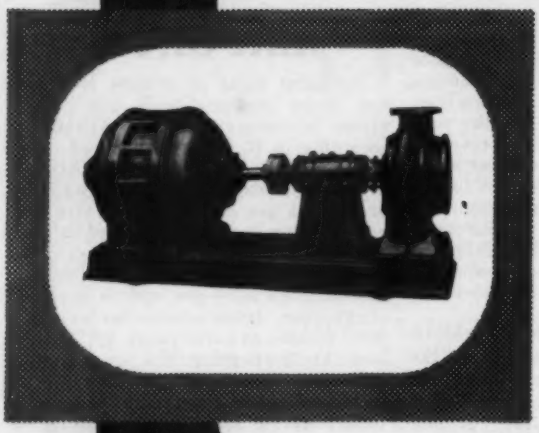
◆ J. J. MEYER has recently been appointed general superintendent of the Cheboygan mill of the North American Pulp and Paper Corporation. Mr. Meyer, who will act as an assistant to S. R. Turner, manager, was formerly manager of Badger Paper Mills, Inc., Peshtigo, Wis.

◆ THE EXECUTIVE OFFICES of the Columbia Alkali Corporation have been moved from 30 Rockefeller Plaza, New York City, to Barberton, Ohio.

High Density Stock gives no trouble

In Warren-equipped plants



Paper mills equipped with Warren pumps handle the heaviest stock easily—smoothly—getting top capacity at rockbottom operating cost. For every detail of Warren pumps is calculated to provide lasting, trouble-free service and to prevent needless, profit-wasting shut-downs.

Take a few of the Warren features for instance: Self-cleaning, non-binding impellers . . . extra-large inlets . . . oversize, rugged parts . . . liberal clearances . . . these are only a few of the reasons why Warren pumps can move your stock smoothly and efficiently.

Write for bulletins and the name of your nearest Warren representative.

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WARREN STEAM PUMP CO., Inc., WARREN, MASS.

An ADDRESS To Remember

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The paper industry knows that our Felts are outstanding for their standard, uniform quality and dependability. . . . These Felts are long-wearing and they assure paper made with the finest finish. . . . They are woven to permit machine operation at top speed at all times.

We are at your service always—just address

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● If it's SERVICE you want . . . specify beater bars and bed plates by Simonds-Worden-White. A century of experience has produced the most generally used line of beater tackle on the market. ● In this line you will find the patterns to meet every stock refining requirement. ● Also S.W.W. paper trimming and chipper knives and Dayton abrasive wheels.

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